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Complete List of Authors:	Mc Sween-Cadieux, Esther; University of Montreal, Psychology Chabot, Catherine; University of Montreal, Psychology Fillol, Amandine; University of Montreal, School of Public Health; Institut de recherche pour le développement, CEPED - IRD-Université de Paris - ERL INSERM SAGESUD Dagenais, Christian; University of Montreal, Psychology
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The use of infographics as a health-related knowledge translation tool: protocol for a scoping review

Esther Mc Sween-Cadieux[1], Catherine Chabot[1], Amandine Fillol[2,3]& Christian Dagenais[1]

Author affiliations

[1] Department of Psychology, University of Montreal, Montreal, Quebec, Canada

[2] School of Public Health, University of Montreal, Montreal, Quebec, Canada.

[3] CEPED, Institute for Research on Sustainable Development, IRD-Université de Paris, ERL INSERM SAGESUD, Paris, France

Corresponding author

Esther Mc Sween-Cadieux, Ph.D

esther.mcsween-cadieux@umontreal.ca

ORCID iD - https://orcid.org/0000-0001-5403-0035

ABSTRACT

Introduction. Efforts to bridge the *know-do gap* have paved the way for the development of the knowledge translation field (KT) which aims to understand how to promote and effectively support the use of evidence through different KT activities and strategies. As a dissemination activity, infographics are gaining more and more ground as a promising KT tool to reach multiple audiences (e.g., health practitioners, patients and families, decision makers). However, to our knowledge, no study has been conducted to map and synthetize the available data on this KT tool. Therefore, this scoping review will explore the depth and breadth of evidence about the use and effectiveness of infographics to improve knowledge uptake (e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour, etc.) in health-related fields.

Methods and analysis. We will use the scoping review methodological framework first proposed by Arksey and O'Malley (2005), improved by Levac *et al.* (2010) and further refined by the Joanna Briggs Institute (2020). The search strategy will be conducted in MEDLINE, CINAHL,

PsycInfo, Social Science Abstracts, LISA, ERIC, Cairn and Google Scholar. We will also search for relevant literature from the reference list of the included articles. Study selection will be conducted by two independent reviewers in two stages: 1) title and abstract screening and 2) full-text screening. The included studies will have empirically evaluated an infographic that disseminates research-based evidence and targets a non-scientific audience. A data extraction form will be standardized and used to extract and chart the data. Afterward, the data will be synthesized to present a descriptive summary of the results.

Ethics and dissemination. Ethics approval is not required. Our dissemination plan includes publication in an open-access peer-reviewed journal, presentation in KT conference and preparation of user-friendly KT tools distributed via social media (webinar, plain language summary and infographic).

KEYWORDS

Infographic, effectiveness, knowledge translation, knowledge uptake, scoping review

Strengths and limitations of this study

→ This scoping review is the first known to synthesize literature on the use and effectiveness of infographics as a knowledge translation intervention to improve knowledge uptake (e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour, etc.) in health-related fields.

→ The results will be important to identify priorities for future research and to propose recommendations for KT practice.

→ We used an established and evidence-based scoping review framework to guide the development of the protocol and we will use the PRISMA-ScR for reporting results.

→ This scoping will include an often-overlooked consultation exercise in order to add a methodological rigour and enhance the validity and usefulness of the review results

→ Although comprehensive, this scoping review has limitations: number of databases, language (French and English), search terms used, focus of health-related fields and empirical studies.

BACKGROUND

Knowledge translation

Efforts to mobilize the phenomenal amount of research results and evidence-based information have paved the way for the development of the knowledge translation field (KT) (1–3). According to the *Canadian Institutes of Health Research*, KT is defined as « *a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge* » to improve health, health services delivery and the health care system (4). KT science aims to understand how to promote and effectively support the use of evidence through different KT activities and strategies (5). The choice of activities will vary according to the KT objective (e.g., raising awareness, improving action through a change in practice among professionals, influence political decision-making, mobilize public action, etc.), the knowledge users' needs, the implementation context and the nature and type of knowledge to be shared (6).

In this study, our focus of interest will be on dissemination activities – also known as end-of grant KT in Canada, which requires expertise in communications and vulgarization (1,7,8). The primary goal of dissemination activities is to « *make new knowledge understandable and accessible so as to effectively reach the groups of actors concerned* » (8). Studies show that the passive dissemination of documents poorly suited to the preferences and characteristics of the target audience is often ineffective (5,8,9). For this purpose, KT field emphasizes the importance to develop dissemination tools that are attractive and adapted to users' preferences (5). For example, dissemination activities may be a summary sheet or infographic, a practice guide, a newsletter, brochures and leaflets, policy briefs, cartoons and videos, books, reports and plain-language articles, etc. (8,10,11). Due to the knowledge translation movement, research dissemination is no longer limited to peer-reviewed publications and scientific conferences and now, more and more innovative and promising tools are used for knowledge sharing. This project will specifically focus on one of these tools, namely infographics (12–14).

Infographics for knowledge translation

Infographics, an abbreviated term for *information graphic* - are increasingly popular in the digital age in which we live. While no single definition of the term infographics has gained wide acceptance, infographic is often understood as an eye-catching one-page document that uses

striking and engaging visuals to communicate complex evidence-based information in an attractive and easily understandable way (15–17). In other words, an infographic « *provides a concise overview of a topic through visually representing information or data using graphics, icons and/or images, with minimal words* » (18). An infographic also usually presents information in a logical manner in order to tell a story (13,14).

Infographics are now everywhere and are used by many different industries: business, environment, food, finance, politics and the healthcare sector (14). When infographics are used for health communication purposes, it is expected that they capture users' attention, help them better understand the information presented, increase their ability to retain and recall the message and encourage users to act in accordance with the information (19). Infographics are thus gaining more and more ground as a promising research or health information dissemination tool to reach multiple potential knowledge users such as health practitioners, patients and families, decision makers or community members. Several initiatives from the research community aim to produce and distribute infographics in scientific journals or on social media (e.g., Twitter, Facebook, LinkedIn, Pinterest, Instagram, etc.). Moreover, as a result of the recent emergence of easy-to-use software for producing infographics, it appears that they are now used as a go-to tool in different contexts, targeting different audiences, and using different formats and designs. Thus, it is important to conduct studies on infographics in order to better understand their real effectiveness to improve knowledge uptake and to highlight best practices to design, produced and shared them. In this regard, more and more empirical studies are carried out to experiment infographics as an intervention for disseminating research results or evidence-based information (17,20–22).

Purpose

However, to our knowledge, no study has been carried out to map the available evidence about this tool. Thereby, our overarching goal is to explore the depth and breadth of evidence about the use and effectiveness of infographics as a KT intervention to improve knowledge uptake (e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour, etc.) in health-related fields. In order to achieve this, we will conduct a scoping review as an evidence synthesis approach (23–25). This approach is recommended when the purpose is, for example, to clarify key concepts and definitions in the literature, to identify key

characteristic or factors related to a concept or to examine how research is conducted on a certain topic (26). According to the Canadian Institutes of Health Research, a scoping review is « *undertaken when feasibility is a concern - either because the potentially relevant literature is thought to be especially vast and diverse (varying by method, theoretical orientation or discipline) or there is a suspicion that not enough literature exists*. » (27). Therefore, a scoping review is particularly useful to identify knowledge gaps in order to inform future research priorities.

METHODS AND ANALYSIS

To guide the scoping review methodology, we will primarily use the scoping review methodological framework first proposed by Arksey and O'Malley (2005) (23), improved by Levac, Colquhoun and O'Brien (2010) (24) and further refined by the Joanna Briggs Institute (2020) (25). A scoping review includes six key phases: (i) identifying the research questions; (ii) identifying relevant studies; (iii) selecting studies; (iv) charting the data; (v) collating, summarizing and reporting the results and (vi) consulting with relevant stakeholders. We will follow the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA): Extension for scoping reviews checklist* to report this study results (28). Our scoping review protocol is inspired and based on previous scoping reviews on similar KT activities and tools (29,30).

Stage 1 | Identifying the research questions

The first stage in the process of conducting a scoping review is to identify research questions related to the purpose of the study. As stated earlier, this scoping review aims to identify the scope of evidence on the use of infographic as a KT intervention to disseminate research results or evidence-based information (in health-related sectors) to those who can benefit from these. Table 1 describes the core elements of the scoping review using the Population-Concept-Context (PCC) mnemonic (25). This is a more flexible alternative to the PICO (Population, Intervention, Comparator and Outcome) framework recommended for conducting systematic reviews.

Table 1 | PCC mnemonic to illustrate the scope and focus of the review	
Population	-Potential knowledge users (a non-scientific audience) such as health professionals, decision makers, patients and families, communities, etc.
Concept	-Infographic or any shareable tool that uses striking and engaging visuals to communicate complex evidence-based information in an easy-to-understand way
Context	- The infographic intervention is used to promote and improve knowledge use (e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour, etc.) in health-related sectors

Four more specific research questions were identified to guide this review (see Figure 1). As the process of conducting a scoping review can be iterative, we will adopt a reflexive approach and research questions will be revised, if needed, as we will become more familiar with the body of evidence.

Q1 | What do we know about the characteristics of infographic intervention?

First, given the uniqueness of each infographic tested, we will identify the main characteristics of each intervention: *content and visual appearance of the infographic, development process, infographic objective and the target audience and delivery method and context (e.g., online versus printed infographic, targeted mail or social media, infographic used alone versus or combined with other activities).* The 7 G.R.A.P.H.I.C principles of public health infographic design *(e.g., coherence, colours, alignment, visual hierarchy, charts used, imagery, heading highlight)* will be used as a general framework to extract relevant data related to visual quality of infographic in selected study (12).

Q2 | What do we know about the outcomes of infographic intervention?

Second, we will identify the available effectiveness data on the use of infographics as a KT intervention. We used the Kirkpatrick model (31) to identify main outcomes variables to extract from the selected studies. This model is commonly used to evaluate the results of educational programs or training (32). Thus, data related to knowledge users' reactions after reading the infographic (e.g., appreciation, perceived usefulness, accessibility), learning (e.g., knowledge, skills, attitude) and ultimately, observed or reported changes in behaviour will be extracted.

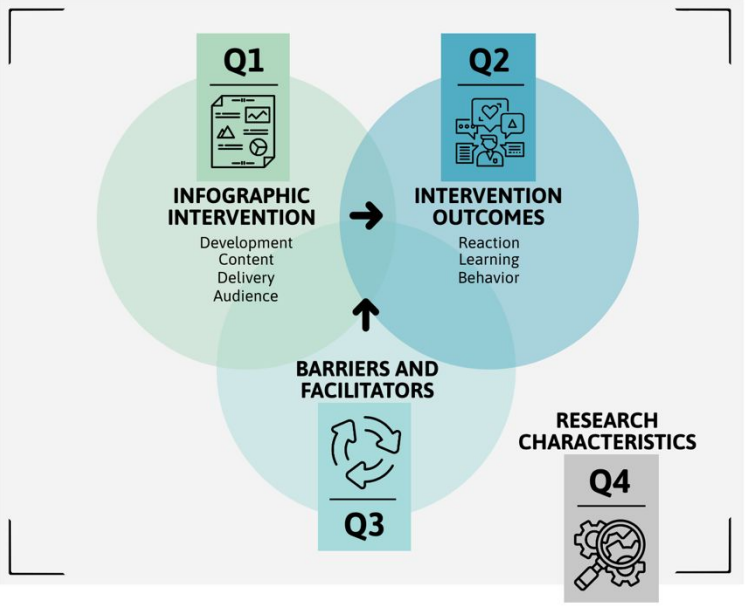
Q3 | What are the factors that influence infographic outcomes?

Thirdly, we believe that a number of factors will influence the relative effectiveness of infographic intervention reported in the studies (e.g., collaborative development with stakeholders, few statistics, limited numbers of colours, etc.). In this regard, this research question aims to understand how outcomes were achieved. We will extract the data related to the potential barriers or facilitators reported by the authors, if applicable. If enough data are available in the selected studies to answer this question, we will be able to propose recommendations for developing infographics based on best practices.

Q4 | What type of research is being conducted to evaluate infographic?

Finally, we want to provide an accurate portrait of the research practices on infographics' intervention. To do this, we will extract and analyze data related to *research design used, study population and sample size, indicators and measurement tools used and types of analysis that have been performed.*

Figure 1 | Overview of research questions



Stage 2 | Identifying relevant studies

Search strategy

The search strategy was developed by the first author (EMC) in collaboration with a senior information specialist. Then, it was circulated to the research team and it was revised and refined, as necessary. Search terms will include various keywords and related terms to (1) Knowledge translation (e.g., research dissemination, health communication, knowledge transfer, etc.) and (2) Infographic (e.g., information graphic, data visualization, visual abstract, etc.) (See Appendix 1). In order to capture as many relevant articles as possible, the list of terms will be iteratively revised after databases searching by the information specialist. The search strategy will not be limited by study design, year of publication or publication status. Searches will be limited to English and French language publication due to resource constraints for translation. The search strategy for the MEDLINE database is presented in Appendix 2. It will be adapted for the other databases and will also be available from the corresponding author, upon request. The search strategy will be validated using the *Peer Review of Electronic Search Strategies* (PRESS) Checklist (33).

Information sources

For the purposes of the scoping review, a systematic search of the published and grey literature will be conducted to identify relevant publications. We will search the following electronic databases from inception onwards: MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycInfo, Social Science Abstracts, Library and Information Science Abstracts (LISA), Education Resources Information Center (ERIC) and Cairn. All these databases were chosen to capture the more comprehensive body of literature possible. A search of the grey literature (e.g., reports, conference proceedings, theses, working papers, evaluations, etc.) will be conducted using Google Scholar and Google Web search engines. Reference lists of key articles will also be hand-searched by the review team to capture any papers missed in the electronic searches. The search in the databases will be conducted by our information specialist. Then, the results will be imported into *Covidence*, a review management software, and all duplicate citations will be removed before the study selection process.

Stage 3 | Study selection

Study selection process will consist of two stages: 1) a title and abstract screening by two independent reviewers, and 2) a full-text screening by the two same reviewers. *Covidence* will be used for efficiently managing all the steps of these stages. Before beginning the screening, the eligibility criteria (inclusion and exclusion) will be pilot tested on a random sample of citations and they will be modified if low agreement is observed between the reviewers (e.g., a kappa statistic less than 60%). If the agreement is acceptable, the reviewers (EMC & CC) will independently screen the titles and abstracts of all publications retrieved to categorize whether the piece of literature is eligible for a full review. To ensure reliability between reviewers during the study selection process, they will meet regularly to discuss uncertainties related to eligibility criteria and to resolve conflicts on study selection and reach consensus. Publications identified as potentially relevant to this scoping review will be retrieved in full text. After the completion of the first stage and prior the full-text review, the two reviewers will meet to revise the scope of the review and to refine or extend inclusions and exclusion criteria, if necessary. The reviewers will also meet regularly during the second stage to discuss and resolve conflicts. A third party (CD or AF) will adjudicate in case of unresolved decisions for inclusion of studies at any stage.

Inclusion criteria

The inclusion criteria are based on the PCC framework (see Table 1 above). Therefore, we will include studies that 1) empirically tested an infographic tool (i.e., which includes textual and visual content), 2) that disseminates research results or other health-related information and 3) targets a non-scientific audience in order to improve knowledge use (e.g., influence attitudes, raise awareness, improve knowledge, change practice, etc.). Other relevant articles, which do not meet these inclusion criteria (e.g., theoretical paper on information design principles, visual literacy, etc.), will be held in a separate folder and will be used to support results' analysis and interpretation, if needed.

Exclusion criteria

We will exclude the following:

→ Studies that do not focus on health-related issues

→ Studies that target children like primary school students

→ Studies that concern one type of graph or charts (e.g., bar charts, forest plots, 3D graphs, etc.)

→ Studies that only address interactive data visualization tools (e.g., video, apps, websites, etc.)

→ Studies that use individual health data (e.g., personal data contained in electronic health records)

→ Studies that use infographics as a form of therapy or clinical intervention

→ Studies that focus on developing skills to visualize data

→ Studies that do not make the evaluated infographic tool available

→ Studies published in other languages than French and English

Stage 4 | Charting the data

A data extraction form will be developed using Microsoft Excel. It will be piloted tested by the two same reviewers on a random sample of 10% of the included articles. They will then meet with the research team to discuss uncertainties and additional potentially relevant information to include in the data extraction form. The remaining 90% of studies will be abstracted by one team member (EMC), and verified by a second reviewer (CC & AF). The data extraction form will therefore be iteratively revised if necessary, to ensure its rigour and ability to capture all relevant data to answer the review questions. Table 2 presents the data that will be extracted from all included studies.

Table 2 | Preliminary data extraction form

	General information of selected studies	- Study title - Author(s) - Year of publication - Country of origin - Topic of the infographic - Terms and concept definition
Q1	*Infographic intervention characteristics*	- Content and visual aspects of the infographic *(e.g., coherence, colours, alignment, visual hierarchy, charts used, imagery, heading highlight)* - Target audience characteristics (e.g., elderly persons, teenagers, physicians, etc.)

		- Delivery method and context *(e.g., online versus printed infographic, targeted mail or social media, infographic used alone versus in addition to other activities).* - Development process *(e.g., expertise and resources, in collaboration with relevant stakeholders, pilot testing, etc.)*
Q2	*Outcomes characteristics*	- Audience's reactions to infographic *(e.g., appreciation/reading experience, perceived usefulness/relevance, accessibility/user-friendliness)* - Audience's learning *(improved knowledge and skills, attitude change)* - Audience's behaviour change (e.g., application of learning in practice, decision-making, etc.)
Q3	*Barriers and facilitators*	- Factors that influenced infographic outcomes - Recommendations or lessons learned related to infographic design or conception, diffusion or sharing practices
Q4	*Research characteristics*	- Study purpose - Methods and research design - Population and sample size - Indicators and measurement tools - Types of data analysis

Because the aim of a scoping review is to identify gaps in the evidence base, we will not appraise the methodological quality or risk of bias of the included articles, which is consistent with guidance on scoping review conduct (23–25).

Stage 5 | Collating, summarizing and reporting the results

The synthesis stage of this review will involve a descriptive summary and thematic analysis of the extracted data (24). To ensure rigour, the analysis will be conducted by two reviewers with

input from collaborators during the process. A descriptive summary of the characteristics of the selected publications (year of publication, country of origin, topics of interest or domain, study design, etc.) will be presented using frequencies and percentages. We will also prepare a descriptive summary table of all data extracted from included studies that are aligned with our research questions (based on variables of Q1-Q2-Q4 presented in Table 2). This table will map key findings regarding the measured effectiveness outcomes in each study, the characteristics of the infographic intervention process, and the characteristics of research designs used. A qualitative descriptive summary will accompany the tabulated results in order to describe how the results relate to our research questions (Q1, Q2 & Q4). Finally, if the extracted data allows it, we will perform a more in-depth qualitative analysis to understand which potential factors influence the outcomes reported in the studies (Q3) (e.g., infographics developed in collaboration with stakeholders or which contain few statistics appear to be more effective). Thus, data related to outcomes results will be discussed in light of the characteristics of the infographics intervention process, in order to understand what can influence their effectiveness. The PRISMA extension designed for scoping reviews will be used to guide the final reporting of the results of this scoping review.

Stage 6 | Consulting with relevant stakeholders

Even if it represents an optional stage, consultation can be a relevant and useful component to include in a scoping review process because it adds methodological rigour and enhance the validity and usefulness of the review results (24,34). Since all authors of this protocol are members of a transdisciplinary research team on knowledge translation in Canada (RENARD team), we will mobilize our network. We will develop a consultation panel that includes KT researchers and practitioners, representatives from KB organizations and graduated students. All RENARD members are familiar with the KT research field and/or with developing and implementing KT activities to improve knowledge uptake. The input from these informants on our findings will be essential to 1) provide us additional references to include in the review as well as 2) add valuable insights on our preliminary results, and 3) develop, contextualize and validate recommendations based on the scoping review's results (e.g., research priorities or criteria for developing effective infographics). The consultation exercise will consist of two focus

groups (one with preliminary results and one at the final stage) with approximately 10 stakeholders per group.

ETHICS AND DISSEMINATION

To our knowledge, this will be the first comprehensive scoping review on the use and effectiveness of infographics as a KT intervention to improve knowledge uptake (e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour, etc.) in health-related field. This review will contribute both to the KT science and practice. In summary, we will identify where gaps exist in the literature, as well as the research area(s) which require a systematic review or primary research. This scoping review will be helpful to improve not only the research carried out in this field (e.g., recommendations for study designs, indicators and measurement tools, etc.) but may also give support for the development of infographic for KT in the future. In this regard, we will be able to describe what an infographic is and what form this tool can take (offering a common terminology and definition in the KT field), to identify in which context infographic can be effective and finally (if possible) to identify key principles to consider for producing an effective infographic in order to improve knowledge uptake.

Ethics approval was exempt for the present study because no data collection was required. The search strategy and data extraction process are planned to be completed by January 2021 and the results will be ready by June 2021. We will ensure broad dissemination of our scoping review findings through multiple activities: publication in an open-access peer-reviewed international journal, presentation in a relevant KT conference (e.g., *Canadian Knowledge Mobilization Forum)* and preparation of user-friendly KT tool such as webinar, plain language summary and infographic which will be disseminated on our research team's website, newsletter and social media (www.equiperenard.org).

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Appendix 1| List of terms for the search strategy

TOOL Terms related to *Infographic*	PURPOSE Terms related to *Knowledge translation*
Infographic*	Health communicat*
Data visuali?ation	Information translation
Information graphic*	Knowledge translation
Visual abstract*	Knowledge transfer
Visual display	Health promotion
Visual graphic*	Health literacy
Visual presentation*	Health education
Visual stor*	Science communicat*
Datagraphic*	Scientific presentation*
Graphic presentation*	Research disseminat*
Visual* data	Research translation
Information visuali?ation*	Research transfer
Graphic* data	Information disseminat*
Info-graphic*	Information communicat*
	Research communicat*
	Knowledge mobili?ation
	Knowledge exchange
	Knowledge broker*
	Knowledge utili?ation
	Knowledge use
	Research impact*
	Research utili?ation
	Evidence use
	Evidence-based
	Research literature
	Medical research
	Research evidence

	Research data
	Scientific knowledge
	Health information*
	Research result*
	Systematic review*
	Medical literature
	Information retention
	Information acquisition

Appendix 2 | Search strategy

Date : July 21st 2020

Database : MEDLINE

Keywords (title and abstract) :

((research adj2 literature).ab,ti. OR (medical adj2 research).ab,ti. OR (research adj2 evidence).ab,ti. OR (research adj2 data).ab,ti. OR (scientific adj2 knowledge).ab,ti. OR (health adj2 information*).ab,ti. OR (research adj2 result*).ab,ti. OR (systematic adj2 review*).ab,ti. OR (medical adj2 literature).ab,ti. OR (information adj2 retention).ab,ti. OR (information adj2 translation).ab,ti. OR (knowledge adj2 translation).ab,ti. OR (knowledge adj2 transfer).ab,ti. OR (health adj2 promotion).ab,ti. OR (health adj2 literacy).ab,ti. OR (health adj2 education).ab,ti. OR (science adj2 communicat*).ab,ti. OR (scientific adj2 presentation*).ab,ti. OR (research adj2 disseminat*).ab,ti. OR (research adj2 translation).ab,ti. OR evidence-based.ab,ti. OR (evidence adj2 "use").ab,ti. OR (knowledge adj2

mobili?ation).ab,ti. OR (knowledge adj2 exchange).ab,ti. OR (knowledge adj2 broker*).ab,ti. OR (knowledge adj2 utili?ation).ab,ti. OR (knowledge adj2 "use").ab,ti. OR (research adj2 impact*).ab,ti. OR (research adj2 utili?ation).ab,ti. OR (research adj2 transfer).ab,ti. OR (information adj2 disseminat*).ab,ti. OR (information adj2 communicat*).ab,ti. OR (research adj2 communicat*).ab,ti. OR (information adj2 acquisition).ab,ti. OR Health Communication/ OR Information Dissemination/ OR Health Promotion/)
AND ("infographic*".ab,ti. OR (data adj2 visuali?ation).ab,ti. OR (information adj2 graphic*).ab,ti. OR (visual adj2 abstract*).ab,ti. OR "datagraphic*".ab,ti. OR (visual adj2 display).ab,ti. OR (visual adj2 graphic*).ab,ti. (visual adj2 presentation*).ab,ti. OR (visual adj2 stor*).ab,ti. OR (graphic adj2 presentation*).ab,ti. OR (information adj2 visuali?ation*).ab,ti. OR (visual* adj2 data).ab,ti. OR (graphic* adj2 data).ab,ti. OR "info-graphic*".ab,ti. OR data visualization/)

Search results: 623

BMJ Open

The use of infographics as a health-related knowledge translation tool: protocol for a scoping review

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The use of infographics as a health-related knowledge translation tool: protocol for a scoping review

Esther Mc Sween-Cadieux[1]

Catherine Chabot[1],

Amandine Fillol[2,3]

Christian Dagenais[1]

Author affiliations

[1] Department of Psychology, University of Montreal, Montreal, Quebec, Canada

[2] School of Public Health, University of Montreal, Montreal, Quebec, Canada.

[3] CEPED, Institute for Research on Sustainable Development, IRD-Université de Paris, ERL INSERM SAGESUD, Paris, France

Corresponding author

Esther Mc Sween-Cadieux, Ph.D

esther.mcsween-cadieux@umontreal.ca

ORCID iD - https://orcid.org/0000-0001-5403-0035

ABSTRACT

Introduction. Efforts to bridge the *know-do gap* have paved the way for the development of the knowledge translation field (KT). KT aims to understand how to promote and effectively support the use of evidence through different activities and strategies. As a dissemination activity, infographics are gaining more and more ground as a promising KT tool to reach multiple health research users (e.g., health practitioners, patients and families, decision makers). However, to our knowledge, no study has been conducted to map and synthesize the available data on this KT tool. Therefore, this scoping review will explore the depth and breadth of evidence about the use and effectiveness of infographics to improve health research uptake (e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour).

Methods and analysis. We will use the scoping review methodological framework first proposed by Arksey and O'Malley (2005), improved by Levac and colleagues (2010) and further refined by the Joanna Briggs Institute (2020). The search strategy will be conducted in MEDLINE, CINAHL, PsycInfo, Social Science Abstracts, LISA, ERIC, Cairn and Google Scholar. We will also search for relevant literature from the reference list of the included articles. Study selection will be conducted by two independent reviewers. Any types of studies will be eligible for inclusion, and we will not have any date, or publication status restrictions. The included studies will have evaluated an infographic that disseminates health research and targets a non-scientific audience. A data extraction form will be standardized and used to extract and chart the data. Afterward, the data will be synthesized to present a descriptive summary of the results.

Ethics and dissemination. Ethics approval is not required. Our dissemination plan includes publication in an open-access peer-reviewed journal, presentation in a KT conference and preparation of user-friendly KT tools distributed via social media (webinar, plain language summary and infographic).

KEYWORDS

Infographic, effectiveness, knowledge translation, knowledge uptake, scoping review, health research.

STRENGTHS AND LIMITATIONS OF THIS STUDY

→ This scoping review is the first known to uncover and synthesize literature related to the use and effectiveness of infographics to improve knowledge uptake in health.

→ This protocol adheres to Levac et al.'s methodological guidelines built on Arksey and O'Malley's original framework and the guidelines from the Joanna Briggs Institute.

→ This review will include multiple reviewers for all phases of study selection and data extraction.

→ A limitation of this study is that only literature in English and French will be included, which will limit the scope of this review.

→ Following accepted scoping review guidelines, the review will not formally assess the quality of included studies, limiting our ability to assess the strength of existing evidence.

BACKGROUND

Knowledge translation

Efforts to mobilize the phenomenal amount of research results and evidence-based information have paved the way for the development of the knowledge translation field (KT) (1–3). According to the *Canadian Institutes of Health Research*, KT is defined as "*a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge*" to improve health, health services delivery and the healthcare system (4). KT science aims to understand how to promote and effectively support the use of evidence through different KT activities and strategies (5). The choice of activities will vary according to the KT objective (e.g., raising awareness, improving action through a change in practice among professionals, influence political decision-making, mobilize public action), the knowledge users' needs, the implementation context and the nature and type of knowledge to be shared (6).

In this study, our focus of interest will be on dissemination activities—also known as end-of grant KT in Canada, which requires expertise in communication and vulgarization (1,7,8). The primary goal of dissemination activities is to "*make new knowledge understandable and accessible so as to effectively reach the groups of actors concerned*" (p.30) (8). Studies show that the passive dissemination of documents poorly suited to the preferences and characteristics of the target audience is often ineffective (5,8,9). For this purpose, KT field emphasizes the importance to develop dissemination tools that are attractive and adapted to users' preferences (5). For example, dissemination activities may be a summary sheet or infographic, a practice guide, a newsletter, brochures and leaflets, policy briefs, cartoons and videos, books, reports and plain-language articles, etc. (8,10,11). Due to the knowledge translation movement, research dissemination is no longer limited to peer-reviewed publications and scientific conferences and now, more and more innovative and promising tools are used for knowledge sharing. This project will specifically focus on one of these tools, namely infographics (12–14).

Infographics for knowledge translation

Infographics, an abbreviated term for *information graphic*—are increasingly popular in the digital age in which we live. While no single definition of the term infographics has gained wide acceptance, infographic is often understood as an eye-catching one-page document that uses striking and engaging visuals to communicate complex evidence-based information in an attractive and easily understandable way (15–17). In other words, an infographic "*provides a concise overview of a topic through visually representing information or data using graphics, icons and/or images, with minimal words"* (p.112) (18). An infographic also usually presents information in a logical manner to tell a story (13,14).

Infographics are now everywhere and are used by many different industries: business, environment, food, finance, politics and the healthcare sector (14). When infographics are used for health communication purposes, it is expected that they capture users' attention, help them better understand the information presented, increase their ability to retain and recall the message and encourage users to act in accordance with the information (19). Infographics are thus gaining more and more ground as a promising research or health information dissemination tool to reach multiple potential knowledge users such as health practitioners, patients and families, decision makers or community members. Several initiatives from the research community aim to produce and distribute infographics in scientific journals or on social media (e.g., Twitter, Facebook, LinkedIn, Pinterest, Instagram). Moreover, because of the recent emergence of easy-to-use software for producing infographics, it appears that they are now used as a go-to tool in different contexts, targeting different audiences, and using different formats and designs. Thus, it is important to conduct studies on infographics to better understand their real effectiveness to improve knowledge uptake and to highlight best practices to design, produced and shared them. In this regard, more and more empirical studies are carried out to evaluate infographics as an intervention for disseminating research results or evidence-based information (17,20–22).

Purpose

To our knowledge, no study has been carried out to map the available evidence about this tool. Thereby, our overarching goal is to explore the depth and breadth of evidence about the use and effectiveness of infographics as a KT intervention to improve knowledge uptake

(e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour) in health. In order to achieve this, we will conduct a scoping review as an evidence synthesis approach (23–25). This approach is recommended when the purpose is, for example, to clarify key concepts and definitions in the literature, to identify key characteristic or factors related to a concept or to examine how research is conducted on a certain topic (26). According to the Canadian Institutes of Health Research, a scoping review is "*undertaken when feasibility is a concern—either because the potentially relevant literature is thought to be especially vast and diverse (varying by method, theoretical orientation or discipline) or there is a suspicion that not enough literature exists*." (p.34) (27). Therefore, a scoping review is particularly useful to identify knowledge gaps to inform future research priorities.

METHODS AND ANALYSIS

To guide the scoping review methodology, we will primarily use the scoping review methodological framework first proposed by Arksey and O'Malley (2005) (23), improved by Levac, Colquhoun and O'Brien (2010) (24) and further refined by the Joanna Briggs Institute (2020) (25). A scoping review includes six key phases: (i) identifying the research questions; (ii) identifying relevant studies; (iii) selecting studies; (iv) charting the data; (v) collating, summarizing and reporting the results and (vi) consulting with relevant stakeholders. This protocol is congruent with the PRISMA-ScR checklist (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses: Extension for scoping reviews),* as will be the reporting of the scoping review (28). This scoping review protocol is inspired and based on previous scoping reviews on similar KT activities and tools (29,30).

Stage 1 | Identifying the research questions

The first stage is to identify research questions related to the purpose of this study. As stated earlier, this scoping review aims to identify the scope of evidence on the use of infographic as a KT intervention to disseminate research results or evidence-based information (in health-related sectors) to those who can benefit from these. Table 1 describes the core elements of the scoping review using the Population-Concept-Context (PCC) mnemonic (25).

Table 1 | PCC mnemonic to illustrate the scope and focus of the review	
Population	-Potential knowledge users (a non-scientific audience) such as health professionals, decision makers, patients and families, communities.
Concept	-Infographic or any shareable tool that uses striking and engaging visuals to communicate complex evidence-based information in an easy-to-understand way
Context	- The infographic intervention is used to promote and improve knowledge use (e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour) in health-related sectors

Four more specific research questions were identified to guide this review (Figure 1). As the process of conducting a scoping review can be iterative, we will adopt a reflexive approach and research questions will be revised, if needed, as we will become more familiar with the body of evidence.

Q1 | What do we know about the characteristics of infographic intervention?

First, given the uniqueness of each infographic tested, we will identify the main characteristics of each intervention: *content and visual appearance of the infographic, development process, infographic objective and the target audience and delivery method and context (e.g., online versus printed infographic, targeted mail or social media, infographic used alone versus or combined with other activities).* The 7 G.R.A.P.H.I.C principles of public health infographic design *(e.g., coherence, colours, alignment, visual hierarchy, charts used, imagery, heading highlight)* will be used as a general framework to extract relevant data related to visual quality of infographic in selected study (12).

Q2 | What do we know about the outcomes of infographic intervention?

Second, we will identify the available effectiveness data on the use of infographics as a KT intervention. We used the Kirkpatrick model (31) to identify main outcome variables to extract from the selected studies. This model is commonly used to evaluate the results of educational programs or training (32). Thus, data related to knowledge users' reactions after

reading the infographic (e.g., appreciation, perceived usefulness, accessibility), learning (e.g., knowledge, skills, attitude) and ultimately, observed or reported changes in behaviour will be extracted.

Q3 | What are the factors that influence infographic outcomes?

Thirdly, many factors can facilitate or hinder the relative effectiveness of infographic intervention reported in the studies. In this regard, this research question aims to explain why an intervention is or is not successful. Inspired by implementation science frameworks (33), we will abstract data on key determinants such as characteristics related to the infographics (what), knowledge users (who), local, organizational and external contexts (where), and knowledge dissemination process (how). If enough data are available in the selected studies to answer this question, we will be able to propose recommendations for developing infographics' intervention based on best practices.

Q4 | What types of research design are used to evaluate infographics?

Finally, we want to provide an accurate portrait of the research practices on infographics' intervention. To do this, we will extract and analyze data related to *research design used, study population and sample size, indicators and measurement tools used and types of analysis that have been performed.*

[Insert Figure 1]

Overview of research questions

Stage 2 | Identifying relevant studies

Search strategy

The search strategy was developed by the first author (EMC) with a senior information specialist. Then, it was circulated to the research team and was revised and refined, as necessary. Search terms will include various keywords and related terms to (1) Knowledge

translation (e.g., research dissemination, health communication, knowledge transfer) and (2) Infographic (e.g., information graphic, data visualization, visual abstract) (See Appendix 1). In order to capture as many relevant articles as possible, the list of terms will be iteratively revised after databases searching by the information specialist. The search strategy will not be limited by study design, year of publication or publication status. Searches will be limited to English and French language publication due to resource constraints for translation. The search strategy for the MEDLINE database is presented in Appendix 2. It will be adapted for the other databases and will also be available from the corresponding author, upon request. The search strategy will be validated using the *Peer Review of Electronic Search Strategies* (PRESS) Checklist (34).

Information sources

For the purposes of the scoping review, a systematic search of the published and grey literature will be conducted to identify relevant publications. We will search the following electronic databases from inception onwards: MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycInfo, Social Science Abstracts, Library and Information Science Abstracts (LISA), Education Resources Information Center (ERIC) and Cairn. All these databases were chosen to capture the more comprehensive body of literature possible. A search of the grey literature (e.g., reports, conference proceedings, theses, working papers, evaluations) will be conducted using Google Scholar and Google Web search engines. Reference lists of key articles will also be hand-searched by the review team to capture any papers missed in the electronic searches. The search in the databases will be conducted by our information specialist. Then, the results will be imported into *Covidence*, a review management software, and all duplicate citations will be removed before the study selection process.

Stage 3 | Study selection

Study selection process will consist of two stages: 1) a title and abstract screening, and 2) a full-text screening performed by two reviewers, independently. We will use *Covidence* – a systematic review software, for efficiently managing all the steps within these stages. Before

beginning the screening, the eligibility criteria (inclusion and exclusion) will be pilot tested on a random sample of citations and they will be modified if low agreement is observed between the reviewers (e.g., a kappa statistic less than 60%). If the agreement is acceptable, the two reviewers will independently screen the titles and abstracts of all publications retrieved to categorize whether the piece of literature is eligible for a full review. To ensure reliability between reviewers during the study selection process, they will meet regularly to discuss uncertainties related to eligibility criteria and to resolve conflicts on study selection and reach consensus. Publications identified as potentially relevant to this scoping review will be retrieved in full text. After the completion of the first stage and prior the full-text review, the two reviewers will meet to revise the scope of the review and to refine or extend inclusion and exclusion criteria, if necessary. The reviewers will also meet regularly during the second stage to discuss and resolve conflicts. A third party will adjudicate in case of unresolved decisions for inclusion of studies at any stage. A flowchart using the PRISMA template for the reporting of the selection process will be produced (Figure 2).

[Insert Figure 2]

Flowchart detailing identification and selection of studies for inclusion in the review

Inclusion criteria

The inclusion criteria are based on the PCC framework (see Table 1 above). Therefore, we will include studies that 1) empirically evaluated an infographic tool (i.e., which includes textual and visual content), 2) that disseminates research results or other health-related information and 3) targets a non-scientific audience in order to improve knowledge use (e.g., influence attitudes, raise awareness, improve knowledge, change practice). Any types of studies will be eligible for inclusion, and we will not have any time, or publication status restrictions. Relevant articles that do not meet these inclusion criteria (e.g., theoretical paper on information design principles, visual literacy) will be held in a separate folder. If necessary, these and will be used to support data analysis and interpretation.

Exclusion criteria

We will exclude the following:

- Studies that do not focus on health-related issues
- Studies that target children like primary school students
- Studies that concern one type of graph or charts (e.g., bar charts, forest plots, 3D graphs)
- Studies that only address interactive data visualization tools (e.g., video, apps, websites)
- Studies that use health data (e.g., personal data contained in electronic health records)
- Studies that use infographics as a form of therapy or clinical intervention
- Studies that focus on developing skills to visualize data
- Studies that do not make the evaluated infographic tool available
- Studies published languages other than French and English

Stage 4 | Charting the data

A data extraction form will be developed using Microsoft Excel. Two reviewers will pilot test the form on a random sample of the included articles (10%). They will then meet with the research team to discuss uncertainties and additional potentially relevant information to include in the data extraction form. Data from the remaining articles will be abstracted by one reviewer, and verified by a second reviewer for correctness and completeness. The data extraction form will be iteratively revised if necessary, to ensure its rigour and ability to capture all relevant data to answer the review questions. Table 2 presents the data that will be extracted from all included studies.

Table 2 | Preliminary data extraction form

	General information	- Study title - Author(s) - Year of publication - Country of origin - Topic of the infographic - Terms and concept definition

Q1	*Infographic intervention characteristics*	- Content and visual aspects of the infographic *(e.g., coherence, colours, alignment, visual hierarchy, charts used, imagery, heading highlight)* - Target audience characteristics (e.g., elderly persons, teenagers, physicians) - Delivery method and context *(e.g., online versus printed infographic, targeted mail or social media, infographic used alone versus in addition to other activities).* - Development process *(e.g., expertise and resources, in collaboration with relevant stakeholders, pilot testing)*
Q2	*Outcomes characteristics*	- Audience's reactions to infographic *(e.g., appreciation/reading experience, perceived usefulness/relevance, accessibility/user-friendliness)* - Audience's learning *(improved knowledge and skills, attitude change)* - Audience's behaviour change (e.g., application of learning in practice, decision-making)
Q3	*Barriers and facilitators*	Factors that influenced infographic outcomes: - Characteristics related to the infographic - Characteristics related to the knowledge users - Characteristics related to the contexts (local, organizational, external) - Characteristics related to the KT process
Q4	*Research design*	- Study purpose - Methods and research design - Population and sample size - Indicators and measurement tools

		- Types of data analysis

Because a scoping review aims to identify gaps in the evidence base, we will not conduct a critical appraisal of included articles, which is consistent with guidance on scoping review conduct (23–25).

Stage 5 | Collating, summarizing and reporting the results

The synthesis stage of this review will involve a descriptive summary and thematic analysis of the extracted data (24). To ensure rigour, two reviewers will conduct the analysis with input from collaborators during the process. A descriptive summary of the selected publications' characteristics (year of publication, country of origin, topics of interest or domain, study design) will be presented using frequencies and percentages. We will also prepare a descriptive summary table of all data extracted from included studies that are aligned with our research questions (based on variables of Q1-Q2-Q4 presented in Table 2). This table will map key findings regarding the measured effectiveness outcomes in each study, the characteristics of the infographic intervention process, and the characteristics of research designs used. A qualitative descriptive summary will accompany the tabulated results to describe how the results relate to our research questions (Q1, Q2 & Q4). Finally, if the extracted data allows it, we will perform a more in-depth qualitative analysis to understand which potential factors influence the outcomes reported in the studies (Q3) (e.g., infographics developed in collaboration with stakeholders or which contain few statistics appear to be more effective). Thus, data related to outcomes results will be discussed in light of the characteristics of the infographics intervention process, in order to understand what can influence their effectiveness. We will use the PRISMA extension designed for scoping reviews to guide the final reporting of this scoping review's results.

Stage 6 | Consulting with relevant stakeholders

Even if it represents an optional stage, consultation can be a relevant and useful component to include in a scoping review process because it adds methodological rigour and enhances the validity and usefulness of the review results (24,35). Since all authors of this protocol are members of a multidisciplinary research team on knowledge translation in Canada (RENARD team), we will mobilize our network. We will develop a consultation panel that includes KT researchers and practitioners, representatives from KB organizations and graduated students. All RENARD members are familiar with the KT research field and/or with developing and implementing KT activities to improve knowledge uptake. The input from these informants on our findings will be essential to 1) provide us additional references to include in the review and 2) add valuable insights on our preliminary results, and 3) develop, contextualize and validate recommendations based on the scoping review's results (e.g., research priorities or criteria for developing effective infographics). The consultation exercise will consist of two focus groups (one with preliminary results and one at the final stage) with approximately 10 stakeholders per group.

Patient and public involvement

Patients and public were not involved in the conception and design of this protocol.

ETHICS AND DISSEMINATION

To our knowledge, this will be the first comprehensive scoping review on the use and effectiveness of infographics as a KT intervention to improve knowledge uptake in health. This review will contribute both to KT science and practice. In summary, we will identify where gaps exist in the literature, and research areas that require a systematic review or primary research. This scoping review will be helpful to improve not only the research carried out in this field (e.g., recommendations for study designs, indicators and measurement tools) but may also give support for the development of infographic for KT in the future. In this regard, we will be able to describe what an infographic is and what form this tool can take (offering a common terminology and definition in the KT field), to identify in which context infographics can be effective, and to identify key principles for developing an effective infographic to improve knowledge uptake.

Ethics approval was exempt for the present study because no data collection was required. The search strategy and data extraction process are planned to be completed by January 2021 and the results will be ready by June 2021. We will ensure broad dissemination of our scoping review findings through multiple activities: publication in an open-access peer-reviewed international journal, presentation in a relevant KT conference (e.g., *Canadian Knowledge Mobilization Forum)* and preparation of user-friendly KT tool such as webinar, plain language summary and infographic. These will be largely disseminated on our research team's website, newsletter and social media (www.equiperenard.org).

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Contributors EMC, CC, AF and CD conceptualized the study. EMC drafted the protocol. CC, AF and CD critically revised the manuscript. EMC wrote the final draft manuscript and all the authors approved it.

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Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

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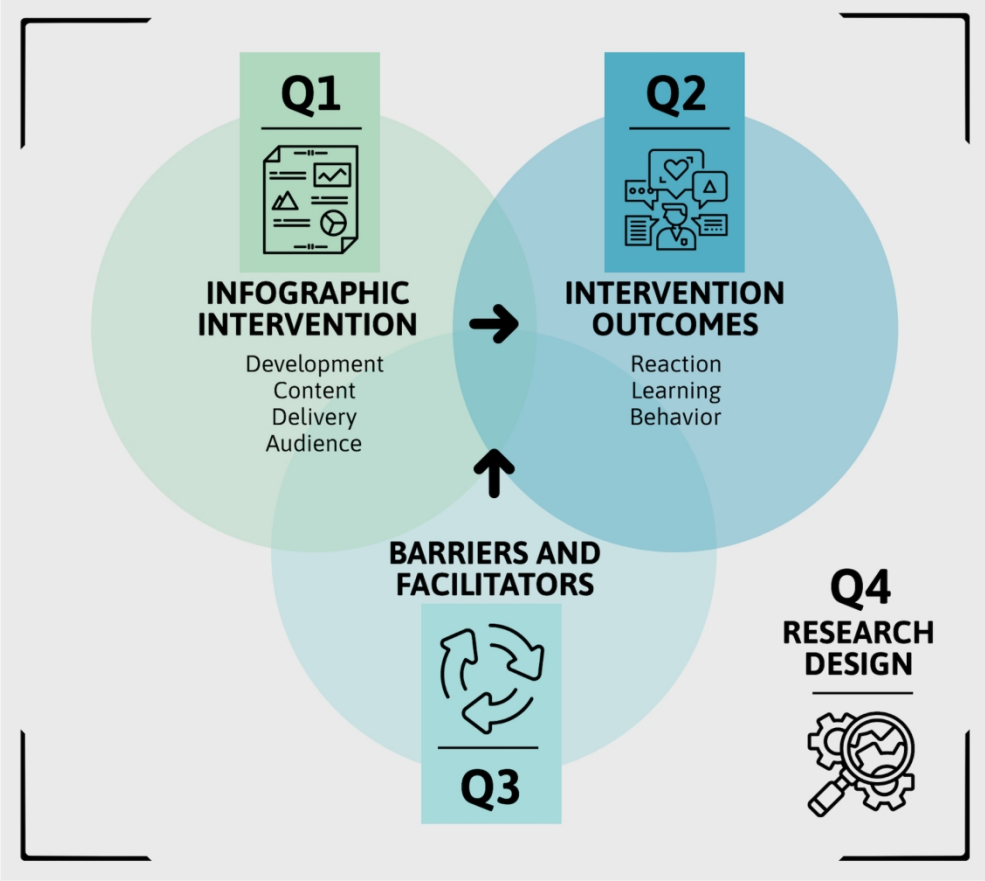
LIST OF FIGURES



Overview of research questions

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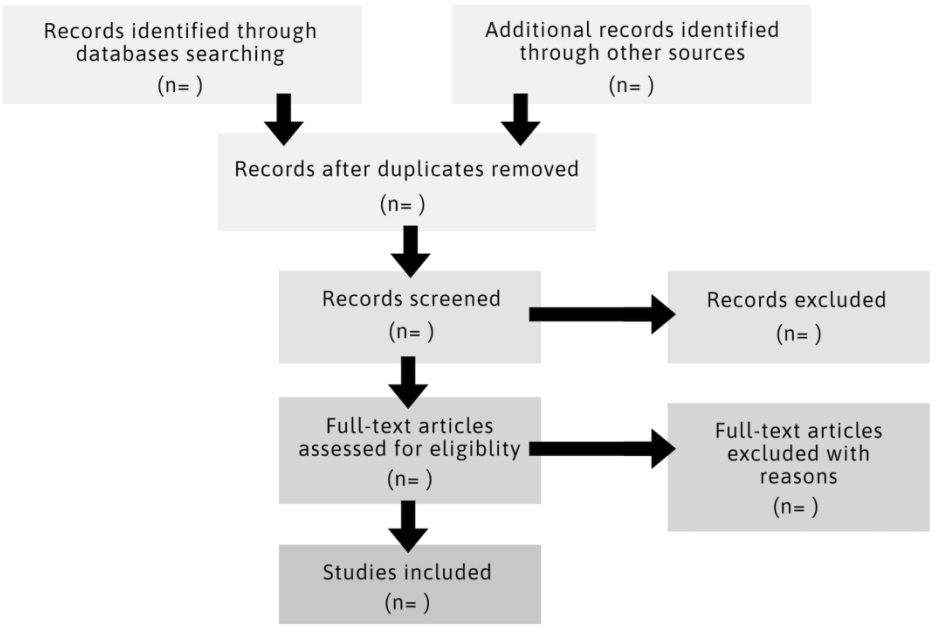

Flowchart detailing identification and selection of studies for inclusion in the review

162x108mm (300 x 300 DPI)

Appendix 1| List of terms for the search strategy

TOOL Terms related to *Infographic*	PURPOSE Terms related to *Knowledge translation*
Infographic*	Health communicat*
Data visuali?ation	Information translation
Information graphic*	Knowledge translation
Visual abstract*	Knowledge transfer
Visual display	Health promotion
Visual graphic*	Health literacy
Visual presentation*	Health education
Visual stor*	Science communicat*
Datagraphic*	Scientific presentation*
Graphic* presentation*	Research disseminat*
Visual* data	Research translation
Information visuali?ation*	Research transfer
Graphic* data	Information disseminat*
Info-graphic*	Information communicat*
	Research communicat*
	Knowledge mobili?ation
	Knowledge exchange
	Knowledge broker*
	Knowledge utili?ation
	Knowledge use
	Research impact*
	Research utili?ation
	Evidence use
	Evidence-based
	Research literature
	Medical research
	Research evidence
	Research data
	Scientific knowledge
	Health information*
	Research result*
	Systematic review*
	Medical literature
	Information retention
	Information acquisition

Appendix 2 | Search strategy

Database: Ovid MEDLINE(R) <1946 to present>

Keywords (title and abstract) :

((research adj2 literature).ab,ti. OR (medical adj2 research).ab,ti. OR (research adj2 evidence).ab,ti. OR (research adj2 data).ab,ti. OR (scientific adj2 knowledge).ab,ti. OR (health adj2 information*).ab,ti. OR (research adj2 result*).ab,ti. OR (systematic adj2 review*).ab,ti. OR (medical adj2 literature).ab,ti. OR (information adj2 retention).ab,ti. OR (information adj2 translation).ab,ti. OR (knowledge adj2 translation).ab,ti. OR (knowledge adj2 transfer).ab,ti. OR (health adj2 promotion).ab,ti. OR (health adj2 literacy).ab,ti. OR (health adj2 education).ab,ti. OR (health adj2 communicat*).ab,ti. OR (science adj2 communicat*).ab,ti. OR (scientific adj2 presentation*).ab,ti. OR (research adj2 disseminat*).ab,ti. OR (research adj2 translation).ab,ti. OR evidence-based.ab,ti. OR (evidence adj2 "use").ab,ti. OR (knowledge adj2 mobili?ation).ab,ti. OR (knowledge adj2 exchange).ab,ti. OR (knowledge adj2 broker*).ab,ti. OR (knowledge adj2 utili?ation).ab,ti. OR (knowledge adj2 "use").ab,ti. OR (research adj2 impact*).ab,ti. OR (research adj2 utili?ation).ab,ti. OR (research adj2 transfer).ab,ti. OR (information adj2 disseminat*).ab,ti. OR (information adj2 communicat*).ab,ti. OR (research adj2 communicat*).ab,ti. OR (information adj2 acquisition).ab,ti. OR Health Communication/ OR Information Dissemination/ OR Health Promotion/) AND ("infographic*".ab,ti. OR (data adj2 visuali?ation).ab,ti. OR (information adj2 graphic*).ab,ti. OR (visual adj2 abstract*).ab,ti. OR "datagraphic*".ab,ti. OR (visual adj2 display).ab,ti. OR (visual adj2 graphic*).ab,ti. OR (visual adj2 presentation*).ab,ti. OR (visual adj2 stor*).ab,ti. OR (graphic* adj2 presentation*).ab,ti. OR (information adj2 visuali?ation*).ab,ti. OR (visual* adj2 data).ab,ti. OR (graphic* adj2 data).ab,ti. OR "info-graphic*".ab,ti. OR data visualization/)

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The use of infographics as a health-related knowledge translation tool: protocol for a scoping review

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The use of infographics as a health-related knowledge translation tool: protocol for a scoping review

Esther Mc Sween-Cadieux[1]

Catherine Chabot[1],

Amandine Fillol[2,3]

Trisha Saha[1]

Christian Dagenais[1]

Author affiliations

[1] Department of Psychology, University of Montreal, Montreal, Quebec, Canada

[2] School of Public Health, University of Montreal, Montreal, Quebec, Canada.

[3] CEPED, Institute for Research on Sustainable Development, IRD-Université de Paris, ERL INSERM SAGESUD, Paris, France

Corresponding author

Esther Mc Sween-Cadieux, Ph.D

esther.mcsween-cadieux@umontreal.ca

ORCID iD - https://orcid.org/0000-0001-5403-0035

ABSTRACT

Introduction. Efforts to bridge the *know-do gap* paved the way for the development of knowledge translation (KT). KT aims to understand how to effectively promote and support the use of evidence through different activities and strategies. As a dissemination activity, infographics are gaining popularity as a promising KT tool to reach multiple health research users (e.g., health practitioners, patients and families, and decision makers). However, to our knowledge, no study has been conducted to map the available evidence on this KT tool using a systematic method. Therefore, this scoping review will explore the depth and breadth of evidence on the use and effectiveness of infographics to improve research uptake (e.g., raising awareness, influencing attitudes, increasing knowledge, informing practice, changing behaviour).

Methods and analysis. We will use the scoping review methodological framework first proposed by Arksey and O'Malley (2005), improved by Levac and colleagues (2010) and further refined by the Joanna Briggs Institute (2020). The search strategy will be conducted in MEDLINE, CINAHL, PsycInfo, Social Science Abstracts, LISA, ERIC, Cairn and Google Scholar. We will also search for relevant literature from the reference lists of the included articles. Study selection will be conducted by two independent reviewers. All study designs will be eligible for inclusion, with no date, or publication status restrictions. The included studies will have evaluated an infographic that disseminates health research and targets a non-scientific audience. A data extraction form will be standardized and used to extract and chart the data, which will then be synthesized to present a descriptive summary of the results.

Ethics and dissemination. Ethics approval is not required. In order to inform the research and KT communities, different dissemination activities will be developed including user-friendly KT tools (e.g., webinar, fact sheet and infographic) and open-access publication and presentations in KT events and conferences.

KEYWORDS

Infographic, dissemination, knowledge translation, knowledge uptake, effectiveness, scoping review, health research.

STRENGTHS AND LIMITATIONS OF THIS STUDY

→ This scoping review is the first known to systematically uncover and synthesize literature related to the use and effectiveness of infographics to improve knowledge uptake in health.

→ This protocol adheres to Levac et al.'s methodological guidelines (2010) built on Arksey and O'Malley's original framework (2005) and the guidelines from the Joanna Briggs Institute (2020).

→ This review will include multiple reviewers in all phases of study selection and data extraction in order to reduce bias and errors.

→ A limitation of this study is that only literature in English and French will be included, which will limit the scope of this review.

→ Following accepted scoping review guidelines, this review will not formally assess the quality of the included studies, limiting our ability to assess the strength of existing evidence.

BACKGROUND

Knowledge translation

Efforts to mobilize the phenomenal amount of research results and evidence-based information have paved the way for the development of the knowledge translation field (KT) (1–3). According to the *Canadian Institutes of Health Research*, KT is defined as "*a dynamic and iterative process that include synthesis, dissemination, exchange and ethically-sound application of knowledge*" to improve health, health service delivery and the healthcare system (4). KT science aims to understand how to promote and effectively support the use of evidence through different KT activities and strategies (5). The choice of activities will vary according to the KT objective (e.g., raising awareness, improving action through a change of practice among professionals, influencing political decision-making, mobilizing public action), the knowledge users' needs, the implementation context and the nature and type of knowledge to be shared (6).

In this study, our focus of interest will be on dissemination activities which require expertise in communication and vulgarization (1,7,8). The primary goal of dissemination activities is to "*make new knowledge understandable and accessible so as to effectively reach the groups of actors concerned*" (p.30) (8). Studies show that the passive dissemination of documents poorly suited to the preferences and characteristics of the target audience is often ineffective (5,8,9). For this purpose, the KT field emphasizes the importance of developing dissemination tools that are attractive and adapted to users' preferences (5). For example, dissemination activities may be a summary sheet or an infographic, a practice guide, a newsletter, brochures, leaflets, policy briefs, cartoons, videos, books, reports, plain-language articles, etc. (8,10,11). Thanks to the KT movement, research dissemination is no longer limited to peer-reviewed publications and scientific conferences and now, more and more innovative and promising tools are used for knowledge sharing. This project will specifically focus on one of these tools, namely infographics (12–14).

Infographics for knowledge translation

Infographics, an abbreviated term for *information graphic*—are increasingly popular in the digital age in which we live (15–17). Although its popularity seems to be increasing, data visualisation is not a new phenomenon as it has been used for many centuries in the forms of maps or illustrations (18). While no single definition of the term infographic has gained wide acceptance, infographics are often understood as an eye-catching one-page document that uses striking and engaging visuals to communicate complex evidence-based information in an attractive and easily understandable way (17,19,20). In other words, an infographic "*uses visual cues, illustrations and large typography to display facts in a long, vertical orientation, and are distributed through print media, embedded into websites, and shared on social media*" (p.2) (21). It also usually presents information in a logical manner to tell a story (13–15,22).

Infographics are now everywhere and are used by many different industries: business, environment, food, finance, politics and the healthcare sector (14). When infographics are used for health communication purposes, it is expected that they capture users' attention, help them better understand the information presented, increase their ability to retain and recall the message and encourage users to act in accordance with the information (23). Infographics are thus gaining more and more ground as a promising research or health information dissemination tool to reach multiple potential knowledge users such as health practitioners, patients and families, decision makers or community members. Several initiatives from the research community aim to produce and distribute infographics in scientific journals or on social media (e.g., Twitter, Facebook, LinkedIn, Pinterest, Instagram). Moreover, because of the recent emergence of easy-to-use software for producing infographics, it appears that they are now used as the go-to tool in different contexts, targeting different audiences, and using different formats and designs. Thus, it is important to conduct studies on infographics to better understand their real effectiveness in improving knowledge uptake and to highlight best practices to design, produce and share them. In this regard, many empirical studies have been carried out to study infographics as an intervention tool for disseminating research results or evidence-based information (20,24–26).

Purpose

To our knowledge, no systematic review has been carried out to map the available evidence on the effectiveness of infographics in supporting dissemination, and such without restrictions regarding for instance study designs and evidence sources. Although a review of literature was made related to this topic of interest (27), our review differs by its systematic methodology specific to scoping reviews, its inclusion of all study designs, and the addition of up-to-date references past 2015, which is significant as there has been an important number of new studies using infographics in the past 5 years. Therefore, our overarching goal is to explore the depth and breadth of evidence about the use and effectiveness of infographics as a KT intervention tool to improve knowledge uptake (e.g., raising awareness, influencing attitudes, increasing knowledge, informing practice, changing behaviour) in health. In order to achieve this, we will conduct a scoping review as an evidence synthesis approach. This approach is recommended when the purpose is, for example, to clarify key concepts and definitions in the literature, to identify key characteristics or factors related to a concept or to examine how research is conducted on a certain topic (28). According to the Canadian Institutes of Health Research, a scoping review is "*undertaken when feasibility is a concern—either because the potentially relevant literature is thought to be especially vast and diverse (varying by method, theoretical orientation or discipline) or there is a suspicion that not enough literature exists*." (p.34) (29). Therefore, a scoping review is particularly useful to identify knowledge gaps in order to inform future research priorities.

METHODS AND ANALYSIS

To guide the scoping review methodology, we will primarily use the scoping review methodological framework first proposed by Arksey and O'Malley (2005) (30), improved by Levac, Colquhoun and O'Brien (2010) (31) and further refined by the Joanna Briggs Institute (2020) (32). A scoping review includes six key phases: (i) identifying the research questions; (ii) identifying relevant studies; (iii) selecting studies; (iv) charting the data; (v) collating, summarizing and reporting the results and (vi) consulting with relevant stakeholders. This protocol is congruent with the PRISMA-ScR checklist (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses: Extension for scoping reviews),* as will be the reporting of the scoping review (33). This scoping review protocol is inspired and based on previous scoping reviews on similar KT activities and tools (34,35).

Stage 1 | Identifying the research questions

The first stage is to identify research questions related to the purpose of this study. As stated earlier, this scoping review aims to identify the scope of evidence on the use of infographics as a KT intervention tool to disseminate research results or evidence-based information (in health-related sectors) to those who can benefit from these. Table 1 describes the core elements of the scoping review using the Population-Concept-Context (PCC) mnemonic (32).

Table 1 | PCC mnemonic to illustrate the scope and focus of the review

Population	- Potential knowledge users (a non-scientific audience) such as health professionals, decision makers, patients and families, and communities.
Concept	- An infographic or any shareable tool that uses striking and engaging visuals to communicate complex evidence-based information in an easy-to-understand way.
Context	- The infographic intervention is used to promote and improve knowledge use (e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour) in health-related sectors

Five specific research questions were identified to guide this review. As the process of conducting a scoping review can be iterative, we will adopt a reflexive approach and research questions will be revised if needed, as we will become more familiar with the body of evidence.

Question 1 | What is an infographic?

Given the recent popularity of infographics for knowledge translation and in order to clarify the nature of this tool, we want to know more about the terms and definitions offered to characterize infographics in the literature. In addition, we will document the theories or conceptual frameworks most used to study infographics (e.g., *dual-coding theory, cognitive load theory, theory of planned behavior*, etc.).

Question 2 | Why are infographics used, for whom and what do they contain?

Next, we will identify the main characteristics of the studied infographics such as their goals (e.g., to raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour), the nature of their content in relation to the information presented, the target audiences, the process used to develop the tool as well as the visual appearance and format of the infographics. The 7 G.R.A.P.H.I.C principles of public health infographic design *(e.g., coherence, colours, alignment, visual hierarchy, charts used, imagery, heading highlight)* will be used as a general framework to extract relevant data related to the visual quality of the infographics in selected studies (12).

Question 3 | How is research conducted in the field of health infographics?

Moreover, we want to provide a portrait on how empirical studies on infographics are designed. As such, from each of the selected studies, we will extract and analyze the data related to its research design (e.g., research objectives, methods, comparator and study procedure), the study population, the sample size, the indicators (outcomes of interest), the measurement tools and the types of analysis performed. We will also document how the infographics were delivered in the studies (e.g., online versus printed infographic, targeted mail or social media, etc.).

Question 4 | How effective have infographics been in achieving their goals?

We will also document the evidence of effectiveness available on the use of infographics as a KT intervention, according to the objectives of the studied infographic (e.g., to raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour). The ability of the studies to demonstrate the effectiveness of their infographics in relation to the outcomes of interest will enable trends to be traced on the potential of this tool. Finally, we will document the authors' conclusions on perceived barriers and enablers to the measured effectiveness of infographics.

Question 5 | What are the knowledge gaps and future research needs?

This last question aims to outline the persisting knowledge gaps. To do this, the main limitations of the selected studies will be described to subsequently highlight the questions that remain unanswered. We hope to be able to make certain recommendations on the needs for future research in order to continue the advancement of knowledge.

Stage 2 | Identifying relevant studies

Search strategy

The search strategy was developed by the first author (EMC) with a senior information specialist. Then, it was circulated to the research team and was revised and refined, as necessary. Search terms will include various keywords and related terms to (1) *Knowledge translation* (e.g., research dissemination, health communication, knowledge transfer) and (2) *Infographic* (e.g., information graphic, data visualization, visual graphic) (See Appendix 1). In order to capture as many relevant articles as possible, the list of terms will be iteratively revised after databases searching by the information specialist. The search strategy will not be limited by study design, year of publication or publication status. Searches will be limited to English and French language publications due to resource constraints. The search strategy for the MEDLINE database is presented in Appendix 2. It will be adapted for the other databases and will also be available from the corresponding author, upon request. The search strategy will be validated using the *Peer Review of Electronic Search Strategies* (PRESS) Checklist (36).

Information sources

For the purposes of the scoping review, a systematic search of the published and grey literature will be conducted to identify relevant publications. We will search the following electronic databases from inception onwards: MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycInfo, Social Science Abstracts, Library and Information Science Abstracts (LISA), Education Resources Information Center (ERIC) and Cairn. All these databases were chosen to capture the most comprehensive body of literature possible. A

search of the grey literature (e.g., reports, conference proceedings, theses, working papers, evaluations) will be conducted using Google Scholar and Google Web search engines. Reference lists of key articles will also be hand-searched by the review team to capture any paper missed in the electronic searches. The search in the databases will be conducted by our information specialist. Then, the results will be imported into *Covidence*, a review management software, and all duplicate citations will be removed before the study selection process.

Stage 3 | Study selection

Study selection process will consist of two stages: 1) a title and abstract screening, and 2) a full-text screening performed by two reviewers, independently. We will use *Covidence* – a systematic review software, to efficiently manage all the steps within these stages. Before beginning the screening, the eligibility criteria (inclusion and exclusion) will be pilot tested on a random sample of citations and they will be modified if low agreement is observed between the reviewers (e.g., a kappa statistic less than 60%). If the agreement is acceptable, the two reviewers will independently screen the titles and abstracts of all publications retrieved to categorize whether the piece of literature is eligible for a full review. To ensure reliability between reviewers during the study selection process, they will meet regularly to discuss uncertainties related to eligibility criteria and to resolve conflicts on study selection to reach consensus. Publications identified as potentially relevant to this scoping review will be retrieved in full text. After the completion of the first stage and prior to the full-text review, the two reviewers will meet to revise the scope of the review and to refine or extend inclusion and exclusion criteria, if necessary. The reviewers will also meet regularly during the second stage to discuss and resolve conflicts. A third party will adjudicate in case of unresolved decisions related to the inclusion of a study at any stage. A flowchart using the PRISMA template for the reporting of the selection process will be produced (Figure 1).

[Insert Figure 1]

Flowchart detailing identification and selection of studies for inclusion in the review

Inclusion criteria

The inclusion criteria are based on the PCC framework (see Table 1 above). Therefore, we will include studies that:

• Empirically evaluate an infographic tool (i.e., which includes textual and visual content)
• Disseminate research results or other health-related information
• Target a non-scientific audience in order to improve knowledge use (e.g., to influence attitudes, raise awareness, improve knowledge, change practice).

All study designs will be eligible for inclusion, and we will not have any time, or publication status restrictions. Relevant articles that do not meet these inclusion criteria (e.g., theoretical paper on information design principles, visual literacy) will be held in a separate folder. If necessary, they will be used to support data analysis and interpretation.

Exclusion criteria

We will exclude studies that:
• Do not focus on health-related issues
• Target children like primary school students
• Concern one type of graph or charts (e.g., bar charts, forest plots, 3D graphs)
• Only address interactive data visualization tools (e.g., video, apps, websites)
• Use health data (e.g., personal data contained in electronic health records)
• Use infographics as a form of therapy or clinical intervention
• Focus on developing skills to visualize data
• Do not make the evaluated infographic tool available
• Are published in languages other than French and English

Stage 4 | Charting the data

A data extraction form will be developed using Microsoft Excel. Two reviewers will pilot test the form on a random sample of the included articles (10%). They will then meet with the research team to discuss uncertainties and additional potentially relevant information to include

in the data extraction form. Data from the remaining articles will be abstracted by one reviewer and verified by a second reviewer to assure correctness and completeness. The data extraction form will be iteratively revised if necessary, to ensure its rigour and ability to capture all relevant data to answer the review questions. Table 2 presents the data that will be extracted from all included studies.

Table 2 | Preliminary data extraction form

	General information	- Study title - Author(s) - Year of publication - Country of origin - Topic of the infographic - Type of article and journal
Q1	What is an infographic?	- Terms used and concept definition - Theory or conceptual framework used
Q2	Why are infographics used, for whom and what do they contain?	- Infographic's goals - Infographic content - Target audience characteristics - Visual aspect and format - Development process
Q3	How is research conducted in the field of health infographics?	- Study purpose (research questions/hypothesis) - Research design and comparator (if experimental study) - Study procedure and delivery method - Population and sample size - Indicators (outcomes of interest) and measurement tools - Types of data analysis

Q4	How effective have infographics been in achieving their goals?	- Main quantitative results / outcomes - Main qualitative results / outcomes - Perceived barriers and enablers
Q5	What are the knowledge gaps and future research needs?	- Study limitations - Future research needs

Since a scoping review aims to identify gaps in the evidence base, we will not conduct a critical appraisal of the included articles, which is consistent with guidance on scoping review conduct .

Stage 5 | Collating, summarizing and reporting the results

The synthesis stage of this review will involve a descriptive summary and thematic analysis of the extracted data (31). To ensure rigour, two reviewers will conduct the analysis with input from collaborators during the process. A descriptive summary of the selected publications' characteristics (year of publication, country of origin, health topic, type of article) will be presented using frequencies and percentages. We will also prepare descriptive summary tables of all data extracted from included studies that are aligned with our research questions (based on variables of research questions presented in Table 2). These tables will map key findings regarding infographic definitions and theories used, characteristics of the studied infographics (goals, content, target audience, visual and format and development process), characteristics of the research designs used, outcomes of interest used to measure infographic's effectiveness, main results, author conclusions and future research needs. A qualitative descriptive summary will accompany the tabulated results to describe how the results relate to our research questions. Finally, if the extracted data allows it, a more in-depth qualitative analysis will be conducted so that the evidence of effectiveness is discussed or nuanced in light of potential barriers and enablers, as stated by the authors. We will use the

PRISMA extension designed for scoping reviews to guide the final reporting of this scoping review's results.

Stage 6 | Consulting with relevant stakeholders

Even if it represents an optional stage, consultation can be a relevant and useful component to include in a scoping review process because it adds methodological rigour and enhances the validity and usefulness of the review results (31,37). Since all authors of this protocol are members of a multidisciplinary research team on knowledge translation in Canada (RENARD team), we will mobilize our network. We will develop a consultation panel that includes KT researchers and practitioners, representatives from KB organizations and graduated students. All RENARD members are familiar with the KT research field and/or with developing and implementing KT activities to improve knowledge uptake. The input from these informants on our findings will be essential to 1) provide us additional references to include in the review and 2) add valuable insights on our preliminary results, and 3) develop, contextualize and validate recommendations based on the scoping review's results (e.g., research priorities or criteria for developing effective infographics). The consultation exercise will consist of two focus groups (one with preliminary results and one at the final stage) with approximately 10 stakeholders per group.

Patient and public involvement

Patients and public were not involved in the conception and design of this protocol.

ETHICS AND DISSEMINATION

To our knowledge, this will be the first comprehensive and systematic scoping review on the use and effectiveness of infographics as a KT intervention tool to improve knowledge uptake in the health sector. This review will contribute both to dissemination science and practice. In summary, we will identify where gaps exist in the literature as well as research areas that require a systematic review or a primary research. This scoping review will be helpful to improve not only the research carried out in this field (e.g., recommendations for study designs, indicators and measurement tools) but also to offer preliminary guidelines to those who plan to

use infographics for KT. In this regard, we will be able to describe what an infographic is and what form this tool can take (offering a common terminology and definition in the KT field), to identify in which contexts infographics can be effective and for what purpose, and to identify key principles to consider when developing an infographic for knowledge translation.

Ethics approval was exempt for the present study because no data collection was required. The search strategy and data extraction process are planned to be completed by April 2021 and the results will be ready by July 2021. Thereafter, a knowledge translation plan will be developed to disseminate this scoping review's results. The main objectives will be to inform the research and KT communities on the state of knowledge on this increasingly popular tool, and to raise awareness on their potential usefulness (or non-usefulness) in certain contexts, depending on the conclusions of our review. To achieve these goals, we will use a combination of different user-friendly KT activities such as webinars, fact sheet summaries and infographics. They will be largely disseminated on our research team's website, newsletters, and social medias (www.equiperenard.org). The results will also be published in an open-access peer-reviewed international journal and presented in relevant KT conferences or events (e.g., *Canadian Knowledge Mobilization Forum).*

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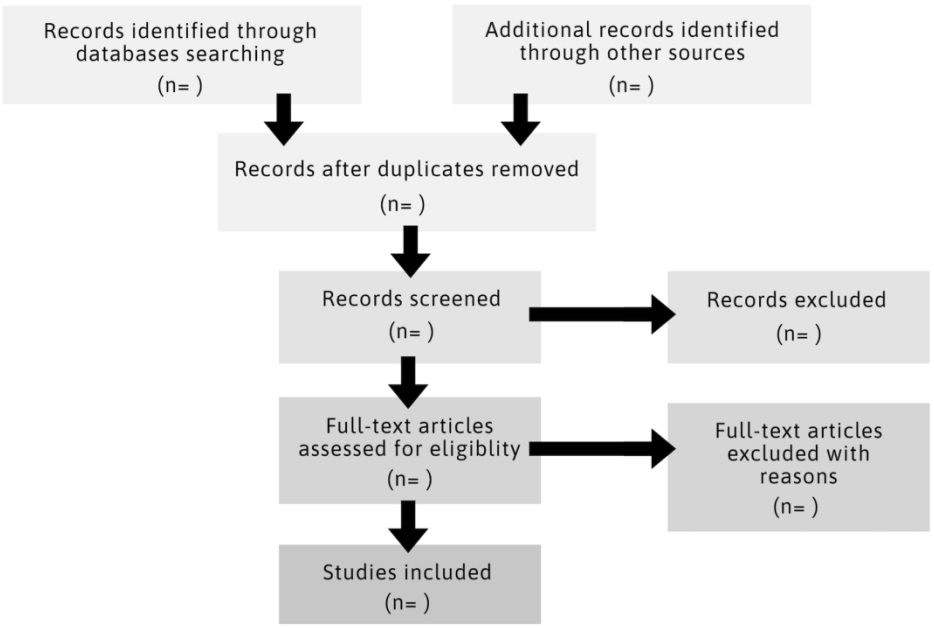
LIST OF FIGURES



Flowchart detailing identification and selection of studies for inclusion in the review

162x108mm (300 x 300 DPI)

Appendix 1| List of terms for the search strategy

TOOL Terms related to *Infographic*	PURPOSE Terms related to *Knowledge translation*
Infographic*	Health communicat*
Data visuali?ation	Information translation
Information graphic*	Knowledge translation
Visual abstract*	Knowledge transfer
Visual display	Health promotion
Visual graphic*	Health literacy
Visual presentation*	Health education
Visual stor*	Science communicat*
Datagraphic*	Scientific presentation*
Graphic* presentation*	Research disseminat*
Visual* data	Research translation
Information visuali?ation*	Research transfer
Graphic* data	Information disseminat*
Info-graphic*	Information communicat*
	Research communicat*
	Knowledge mobili?ation
	Knowledge exchange
	Knowledge broker*
	Knowledge utili?ation
	Knowledge use
	Research impact*
	Research utili?ation
	Evidence use
	Evidence-based
	Research literature
	Medical research
	Research evidence
	Research data
	Scientific knowledge
	Health information*
	Research result*
	Systematic review*
	Medical literature
	Information retention
	Information acquisition

Appendix 2 | Search strategy

Database: Ovid MEDLINE(R) <1946 to present>

Searched online : 21/07/2020

Keywords (title and abstract) :

Search results: 656

((research adj2 literature).ab,ti. OR (medical adj2 research).ab,ti. OR (research adj2 evidence).ab,ti. OR (research adj2 data).ab,ti. OR (scientific adj2 knowledge).ab,ti. OR (health adj2 information*).ab,ti. OR (research adj2 result*).ab,ti. OR (systematic adj2 review*).ab,ti. OR (medical adj2 literature).ab,ti. OR (information adj2 retention).ab,ti. OR (information adj2 translation).ab,ti. OR (knowledge adj2 translation).ab,ti. OR (knowledge adj2 transfer).ab,ti. OR (health adj2 promotion).ab,ti. OR (health adj2 literacy).ab,ti. OR (health adj2 education).ab,ti. OR (health adj2 communicat*).ab,ti. OR (science adj2 communicat*).ab,ti. OR (scientific adj2 presentation*).ab,ti. OR (research adj2 disseminat*).ab,ti. OR (research adj2 translation).ab,ti. OR evidence-based.ab,ti. OR (evidence adj2 "use").ab,ti. OR (knowledge adj2 mobili?ation).ab,ti. OR (knowledge adj2 exchange).ab,ti. OR (knowledge adj2 broker*).ab,ti. OR (knowledge adj2 utili?ation).ab,ti. OR (knowledge adj2 "use").ab,ti. OR (research adj2 impact*).ab,ti. OR (research adj2 utili?ation).ab,ti. OR (research adj2 transfer).ab,ti. OR (information adj2 disseminat*).ab,ti. OR (information adj2 communicat*).ab,ti. OR (research adj2 communicat*).ab,ti. OR (information adj2 acquisition).ab,ti. OR Health Communication/ OR Information Dissemination/ OR Health Promotion/) **AND** ("infographic*".ab,ti. OR (data adj2 visuali?ation).ab,ti. OR (information adj2 graphic*).ab,ti. OR (visual adj2 abstract*).ab,ti. OR "datagraphic*".ab,ti. OR (visual adj2 display).ab,ti. OR (visual adj2 graphic*).ab,ti. OR (visual adj2 presentation*).ab,ti. OR (visual adj2 stor*).ab,ti. OR (graphic* adj2 presentation*).ab,ti. OR (information adj2 visuali?ation*).ab,ti. OR (visual* adj2 data).ab,ti. OR (graphic* adj2 data).ab,ti. OR "info-graphic*".ab,ti. OR data visualization/)

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The use of infographics as a health-related knowledge translation tool: protocol for a scoping review

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The use of infographics as a health-related knowledge translation tool: protocol for a scoping review

Esther Mc Sween-Cadieux[1]

Catherine Chabot[2]

Amandine Fillol[3,4]

Trisha Saha[2]

Christian Dagenais[2]

Author affiliations

[1] Department of School and Social Adaptation Studies, Faculty of Education, Université de Sherbrooke, Sherbrooke, Quebec, Canada

[2] Department of Psychology, Université de Montréal, Montreal, Quebec, Canada

[3] School of Public Health, Université de Montréal, Montreal, Quebec, Canada.

[4] CEPED, Institute for Research on Sustainable Development, IRD-Université de Paris, ERL INSERM SAGESUD, Paris, France

Corresponding author

Esther Mc Sween-Cadieux, Ph.D
esther.mc.sween-cadieux@usherbrooke.ca
ORCID iD - https://orcid.org/0000-0001-5403-0035

ABSTRACT

Introduction. Efforts to bridge the know–do gap have paved the way for development of the field of knowledge translation (KT). KT aims to understand how evidence use can best be promoted and supported through different activities. For dissemination activities, infographics are gaining in popularity as a promising KT tool to reach multiple health research users (e.g., health practitioners, patients and families, decision-makers). However, to our knowledge, no study has yet mapped the available evidence on this tool using a systematic method. This scoping review will explore the depth and breadth of evidence on infographics use and its effectiveness in improving research uptake (e.g., raising awareness, influencing attitudes, increasing knowledge, informing practice, changing behaviour).

Methods and analysis. We will use the scoping review methodological framework first proposed by Arksey and O'Malley (2005), improved by Levac and colleagues (2010), and further refined by the Joanna Briggs Institute (2020). The search will be conducted in MEDLINE, CINAHL, PsycInfo, Social Science Abstracts, LISA, ERIC, Cairn, and Google Scholar. We will also search for relevant literature from the reference lists of the included publications. Two independent reviewers will select the studies. All study designs will be eligible for inclusion, with no date or publication status restrictions. The included studies will have evaluated infographics that disseminate health research evidence and target a non-scientific audience. A data extraction form will be developed and used to extract and chart the data, which will then be synthesized to present a descriptive summary of the results.

Ethics and dissemination. Ethics approval is not required. To inform the research and KT communities, various dissemination activities will be developed, including user-friendly KT tools (e.g., webinars, fact sheets, infographics), open-access publication, and presentations at KT events and conferences.

KEYWORDS

Infographic, dissemination, knowledge translation, knowledge uptake, effectiveness, scoping review, health research.

STRENGTHS AND LIMITATIONS OF THIS STUDY

→ This scoping review is the first known to systematically uncover and synthesize literature related to infographics use and effectiveness in improving knowledge uptake in health.

→ This protocol adheres to Levac et al.'s methodological guidelines (2010) built on Arksey and O'Malley's original framework (2005), as well as to guidelines from the Joanna Briggs Institute (2020).

→ To reduce bias and errors, this review will include multiple reviewers in all phases of study selection and data extraction.

→ The scope of this review will be limited, in that only literature published in English and French will be included.

→ Following accepted scoping review guidelines, this review will not formally assess the quality of the included studies, limiting our ability to assess the strength of existing evidence.

BACKGROUND

Knowledge translation

Efforts to mobilize vast amounts of research results and evidence-based information have paved the way for development of the knowledge translation (KT) field (1–3). The Canadian Institutes of Health Research defines KT as "*a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge*" to improve health, health services delivery, and the healthcare system (4). KT science aims to understand how evidence use can best be promoted and supported through different KT activities (5). The choice of activities will vary depending on KT objectives (e.g., raising awareness, improving action through practice change among professionals, influencing political decision-making, mobilizing public action), knowledge users' needs, implementation context, and the nature and type of knowledge to be shared (6).

In this study, we will focus on dissemination activities that require expertise in plain-language communication and popularization (1,7,8). The primary goal of dissemination activities is to "*make new knowledge understandable and accessible so as to effectively reach the groups of actors concerned*" (p. 30) (8). Studies have shown that passive dissemination of documents poorly suited to the preferences and characteristics of the target audience is often ineffective (5,8,9). Accordingly, the KT field emphasizes the importance of developing dissemination tools that are attractive and adapted to users' preferences (5). Examples of dissemination tools include summary sheets or infographics, practice guides, newsletters, brochures, leaflets, policy briefs, cartoons, videos, books, reports, plain-language articles, etc. (8,10,11). Thanks to the KT movement, research dissemination is no longer limited to peer-reviewed publications and scientific conferences. More innovative and promising tools are now used for knowledge sharing. This project will specifically focus on one of these tools, infographics (12–14).

Infographics for knowledge translation

Infographics—an abbreviated term for *informational graphics*—have become increasingly popular in today's digital age (15–17). In fact, however, data visualization is not a new phenomenon; maps and illustrations, for instance, have been around for many centuries (18). While no single definition has gained wide acceptance, an infographic is often understood as an eye-catching one-page document that uses striking and engaging visuals to communicate complex evidence-based information in an attractive and easily understandable way (17,19,20). An infographic "*uses visual cues, illustrations and large typography to display facts in a long, vertical orientation, and are distributed through print media, embedded into websites, and shared on social media*" (p. 2) (21). It usually presents information in a logical manner to tell a story (13–15,22).

Infographics are ubiquitous and used by many different industries and sectors: business, environment, food, finance, politics, and the healthcare sector, among others (14). Their purpose is to capture users' attention, help them better understand the information presented, increase their ability to retain and recall the message, and encourage them to act in accordance with the information (23). Infographics are thus gaining ground as a promising research or health information dissemination tool to reach multiple potential knowledge users, such as health practitioners, patients and families, decision-makers, and community members. Several research community initiatives have been aimed at producing and distributing infographics in scientific journals or on social media (e.g., Twitter, Facebook, LinkedIn, Pinterest, Instagram). Moreover, with the recent emergence of user-friendly software for producing infographics, they have become the go-to tool in many contexts, targeting different audiences and using a variety of formats and designs. Thus, research on infographics is essential to better understand their real effectiveness in improving knowledge uptake and to highlight best practices for designing, producing, and sharing them. In fact, many empirical studies have explored the use of infographics as an intervention tool for disseminating research results or evidence-based information (20,24–26).

Purpose

To our knowledge, no knowledge synthesis has been conducted using a methodology that is both systematic and inclusive of all study designs and evidence sources to map the

available evidence on the effectiveness of infographics in supporting dissemination. Although a review of literature was produced related to this topic (27), our review differs in that we use a systematic methodology specific to scoping reviews, include all study designs, and add references published since 2015, to capture the important number of new studies using infographics in recent years. Our overarching goal is to explore the depth and breadth of evidence about the use and effectiveness of infographics as a KT intervention tool to improve knowledge uptake in health (e.g., raising awareness, influencing attitudes, increasing knowledge, informing practice, changing behaviour). To produce an evidence synthesis, we will conduct a scoping review. This approach is recommended when the purpose is, for example, to clarify key concepts and definitions in the literature, to identify key characteristics or factors related to a concept, or to examine how research is conducted on a certain topic (28). According to the Canadian Institutes of Health Research, a scoping review is "*undertaken when feasibility is a concern—either because the potentially relevant literature is thought to be especially vast and diverse (varying by method, theoretical orientation or discipline) or there is a suspicion that not enough literature exists*" (p. 34) (29). As such, a scoping review is useful to identify knowledge gaps that might be addressed in future research.

METHODS AND ANALYSIS

To guide our methodology, we will primarily use the scoping review methodological framework first proposed by Arksey and O'Malley (2005) (30), improved by Levac, Colquhoun and O'Brien (2010) (31), and further refined by the Joanna Briggs Institute (2020) (32). A scoping review includes six key phases: 1) identifying the research questions; 2) identifying relevant studies; 3) selecting studies; 4) charting the data; 5) collating, summarizing, and reporting the results; and 6) consulting with relevant experts. This protocol is congruent with the PRISMA-ScR checklist (*Preferred Reporting Items for Systematic reviews and Meta-Analyses: Extension for Scoping Reviews),* as will be the reporting of the scoping review (33). This scoping review protocol is inspired by and based on previous scoping reviews on similar KT activities and tools (34,35).

Stage 1 | Identifying the research questions

The first stage is to identify research questions related to the purpose of this study. As stated earlier, this scoping review is aimed at determining the scope of evidence on infographics use as a KT intervention tool to disseminate research results or evidence-based information (in health-related sectors) to those who can benefit. Table 1 describes the core elements of the scoping review based on the Population-Concept-Context (PCC) framework (32).

Table 1 | PCC framework to illustrate the scope and focus of the review	
Population	- Potential knowledge users (non-scientific audience), such as health professionals, decision-makers, patients and families, and communities.
Concept	- An infographic or any shareable tool that uses striking and engaging visuals to communicate complex evidence-based information in a user-friendly way.
Context	- The use, in health-related sectors, of an infographic intervention to promote and improve knowledge use (e.g., raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour)

We formulated five specific research questions to guide this review. Because the scoping review process can be iterative, we will adopt a reflexive approach and will revise research questions, if needed, as we become more familiar with the body of evidence.

Question 1 | What is an infographic?

Given the recent popularity of infographics for KT, and to clarify the nature of this tool, we want to know more about the terms and definitions put forward in the literature to characterize infographics. We will also document the theories or conceptual frameworks most used to study infographics (e.g., *dual-coding theory, cognitive load theory, theory of planned behavior*, etc.).

Question 2 | Why are infographics used, for whom, and what do they contain?

Next, we will identify the main characteristics of the studied infographics, such as their goals (e.g., to raise awareness, influence attitudes, increase knowledge, inform practice, change behaviour), the nature of their content in relation to the information presented, their

target audiences, the process used to develop the tool, as well as the visual appearance and format of the infographics. We will use the basic principles of public health infographic design (e.g., coherence, colours, alignment, visual hierarchy, use of charts, imagery, headings) as a general framework to extract data related to the visual quality of the infographics in the selected studies (12).

Question 3 | How is research conducted in the field of health infographics?

We aim to produce a portrait of how empirical studies on infographics are designed. From each of the selected studies, we will extract and analyze data related to its research design (e.g., objectives, methods, comparator(s), study procedure), study population, sample size, indicators (outcomes of interest), measurement tools, and types of analyses. We will also document how the infographics were delivered in the studies (e.g., online versus printed infographic, targeted mail, social media).

Question 4 | How effective have infographics been in achieving their goals?

We will document the available evidence on the effectiveness of infographics as a KT intervention in relation to the objectives of the infographics used. The potential of this tool will be discernable to the extent that the studies will have demonstrated their infographics' effectiveness in relation to outcomes of interest. Finally, we will document the authors' conclusions regarding perceived barriers and enablers of infographics effectiveness.

Question 5 | What are the knowledge gaps and future research needs?

With this last question, we aim to uncover persisting knowledge gaps. To do this, we will describe the main limitations of the selected studies, with a view to discerning any questions that remain unanswered. We hope to make recommendations on needs for research to further advance knowledge.

Stage 2 | Identifying relevant studies

Search strategy

The search strategy was developed by the first author (EMC) with a senior information specialist. It was then circulated to the research team and further refined. Search terms will include keywords and terms related to: (1) *knowledge translation* (e.g., research dissemination, health communication, knowledge transfer) and (2) *infographic* (e.g., informational graphic, data visualization, visual graphic) (see Appendix 1). To capture as many relevant publications as possible, the list of terms will be iteratively revised after searching the databases. The search strategy will not be limited by study design, year of publication, or publication status. Searches will be limited to English and French language publications, due to resource constraints. The search strategy for the MEDLINE database is presented in Appendix 2. It will be adapted for the other databases and will also be available from the corresponding author upon request. The search strategy will be validated using the *Peer Review of Electronic Search Strategies* (PRESS) checklist (36).

Information sources

A systematic search of the published and grey literature will be conducted to identify relevant publications. We will search the following electronic databases from inception onwards: MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycInfo, Social Science Abstracts, Library and Information Science Abstracts (LISA), Education Resources Information Center (ERIC), and Cairn. These databases were chosen to capture the most comprehensive body of literature possible. The grey literature (e.g., reports, conference proceedings, theses, working papers, evaluations) will be searched using Google Scholar and Google Web search engines. Reference lists of key publications will also be hand-searched by the review team to capture any paper missed in the electronic searches. The search in the databases will be conducted by our information specialist. Results will be imported into *Covidence*, a systematic review software program, and duplicate citations will be removed before the study selection process.

Stage 3 | Selecting studies

The study selection process will consist of two stages: 1) title and abstract screening, and 2) full-text screening by two reviewers, independently. We will use *Covidence* to manage these two stages of selection. Before beginning the screening, the eligibility criteria (inclusion and exclusion) will be pilot tested on a random sample of publications and modified if low inter-reviewer agreement is observed (e.g., a kappa statistic below 60%). If the level of agreement is acceptable, the two reviewers will independently screen the titles and abstracts of all publications retrieved to determine whether they are eligible for full review. The reviewers will meet regularly to discuss uncertainties related to eligibility criteria and to resolve differences in study selection, with a view to ensuring inter-reviewer reliability and reaching consensus. Publications identified as potentially relevant to this scoping review will be retrieved in full text. After completion of the first stage and prior to the full-text review, the two reviewers will meet to revisit the scope of the review and to refine or extend inclusion and exclusion criteria, if necessary. They will also meet regularly during the second stage to discuss and resolve differences. In cases of unresolved decisions related to the inclusion of a study at any stage, a third researcher will adjudicate. A flowchart will be produced using the PRISMA template to report on the selection process (Figure 1).

[Insert Figure 1]

Flowchart detailing identification and selection of studies for inclusion in the review

Inclusion criteria

The inclusion criteria are based on the PCC framework (see Table 1). As such, we will include studies that:

- empirically evaluate an infographic tool (i.e., one that includes textual and visual content);
- disseminate research results or other health-related information;
- target a non-scientific audience to improve knowledge use.

All study designs will be eligible for inclusion, with no publication date or status restrictions. Relevant publications that do not meet these inclusion criteria (e.g., theoretical paper on information design principles, visual literacy) will be held in a separate folder; if appropriate, they will be used to support data analysis and interpretation.

Exclusion criteria

We will exclude studies that:

- do not focus on health-related issues;
- target children, such as primary school students;
- concern one type of graph or charts (e.g., bar charts, forest plots, 3D graphs);
- only address interactive data visualization tools (e.g., video, apps, websites);
- use health data (e.g., personal data contained in electronic health records);
- use infographics as a form of therapy or clinical intervention;
- focus on developing data visualization skills;
- do not make the evaluated infographic tool available;
- are published in languages other than French and English.

Stage 4 | Charting the data

After completing the study selection process using Covidence, we will develop a data extraction form using Microsoft Excel® to capture the data of interest from the selected studies. Two reviewers will pilot test the form on a random sample of the included studies (10%). They will then meet with the research team to discuss uncertainties and additional potentially relevant information to be included in the form. Data from the remaining studies will be abstracted by one reviewer and verified by a second reviewer to ensure correctness and completeness. The data extraction form will be iteratively revised as necessary, to ensure its rigour and ability to capture all relevant data to answer the review questions. Table 2 presents the data to be extracted.

Table 2 | Preliminary data extraction form		
	General information	- Study title

		- Author(s) - Year of publication - Country of origin - Topic of the infographic - Type of article and journal
Q1	What is an infographic?	- Terms used and concept definition - Theory or conceptual framework used
Q2	Why are infographics used, for whom, and what do they contain?	- Objectives of the infographic used - Infographic content - Target audience characteristics - Visual aspect and format - Development process
Q3	How is research conducted in the field of health infographics?	- Study purpose (research questions/hypothesis) - Research design and comparator (if experimental study) - Study procedure and delivery method - Population and sample size - Indicators (outcomes of interest) and measurement tools - Types of data analysis
Q4	How effective have infographics been in achieving their goals?	- Main quantitative results / outcomes - Main qualitative results / outcomes - Perceived barriers and enablers
Q5	What are the knowledge gaps and future research needs?	- Study limitations - Future research needs

Given that the aim of a scoping review is primarily to identify gaps in the evidence base, and consistent with guidance on conducting scoping reviews, we will not conduct a critical appraisal of the selected studies.

Stage 5 | Collating, summarizing, and reporting the results

The synthesis stage of this review will involve producing a descriptive summary and thematic analysis of the extracted data (31). To ensure rigour, two reviewers will conduct the analysis with input from collaborators during the process. A descriptive summary of the publications' characteristics (year of publication, country of origin, health topic, type of article) will be presented using frequencies and percentages. We will also prepare descriptive summary tables of all data extracted from included studies that are aligned with our research questions (based on the research question variables presented in Table 2). These tables will map key findings regarding infographic definitions and theories used, characteristics of the studied infographics (goals, content, target audience, visual and format, development process), characteristics of the research designs, outcomes of interest used to measure the infographic's effectiveness, main results, author conclusions, and future research needs. We will prepare a qualitative descriptive summary to accompany the tabulated results to describe how they relate to our research questions. Finally, if the extracted data allow it, a more in-depth qualitative analysis will be conducted to discuss or nuance the evidence of effectiveness in light of potential barriers and enablers identified by the authors. We will use the PRISMA Extension for Scoping Reviews to guide the final reporting of our results.

Stage 6 | Consultation

While consultation is optional, it can be a relevant and useful stage of a scoping review process, adding methodological rigour and enhancing the validity and usefulness of the review results (31,37). Given that all authors of this protocol are members of a multidisciplinary research team on KT in Canada (RENARD team), we will mobilize our network. We will develop a consultation panel made up of KT researchers, including graduate students and practitioners.

All RENARD members have expertise in the KT research field and/or in developing and implementing KT activities to improve knowledge uptake. Input from these informants will be essential to: 1) provide additional references to include in the review; 2) contribute valuable insights into our preliminary results; and 3) develop, contextualize, and validate recommendations based on the results of our scoping review (e.g., research priorities, criteria for developing effective infographics). The consultation exercise will consist of two focus groups (one on preliminary results and one at the final stage) with approximately 10 experts per group.

Patient and public involvement

Patients and members of the public were not involved in the conception and design of this protocol.

ETHICS AND DISSEMINATION

To our knowledge, this will be the first comprehensive and systematic scoping review on the use and effectiveness of infographics as a KT intervention tool to improve knowledge uptake in the health sector. This review will contribute to both dissemination science and practice. In summary, we will identify gaps in the literature as well as research areas that require systematic review or primary research. This scoping review will be helpful not only to improve research carried out in this field (e.g., recommendations for study designs, indicators, measurement tools), but also to offer preliminary guidelines to those planning to use infographics for KT. This review will enable us to describe what an infographic is and what form(s) this tool can take (offering a common terminology and definition in the KT field), to identify in which contexts infographics can be effective and for what purposes, and to identify key principles to consider when developing an infographic for KT.

The present study is exempt from ethics approval because it involves no patient or personal data collection. After completion of the search strategy and data extraction process in the spring, the scoping review results are expected to be ready by August 2021. We will then develop a KT plan to disseminate the results. The main objectives will be to inform the research and KT communities on the state of knowledge on this increasingly popular tool and to raise awareness of its potential usefulness (or non-usefulness) in certain contexts, depending on the

conclusions of our review. To achieve these objectives, we will use a combination of user-friendly KT activities such as webinars, fact sheets, summaries, and infographics. They will be widely disseminated via our research team's website (www.equiperenard.org), newsletters, and social media. Results will also be published in an open-access peer-reviewed international journal and presented in relevant KT conferences or events (e.g., Canadian Knowledge Mobilization Forum).

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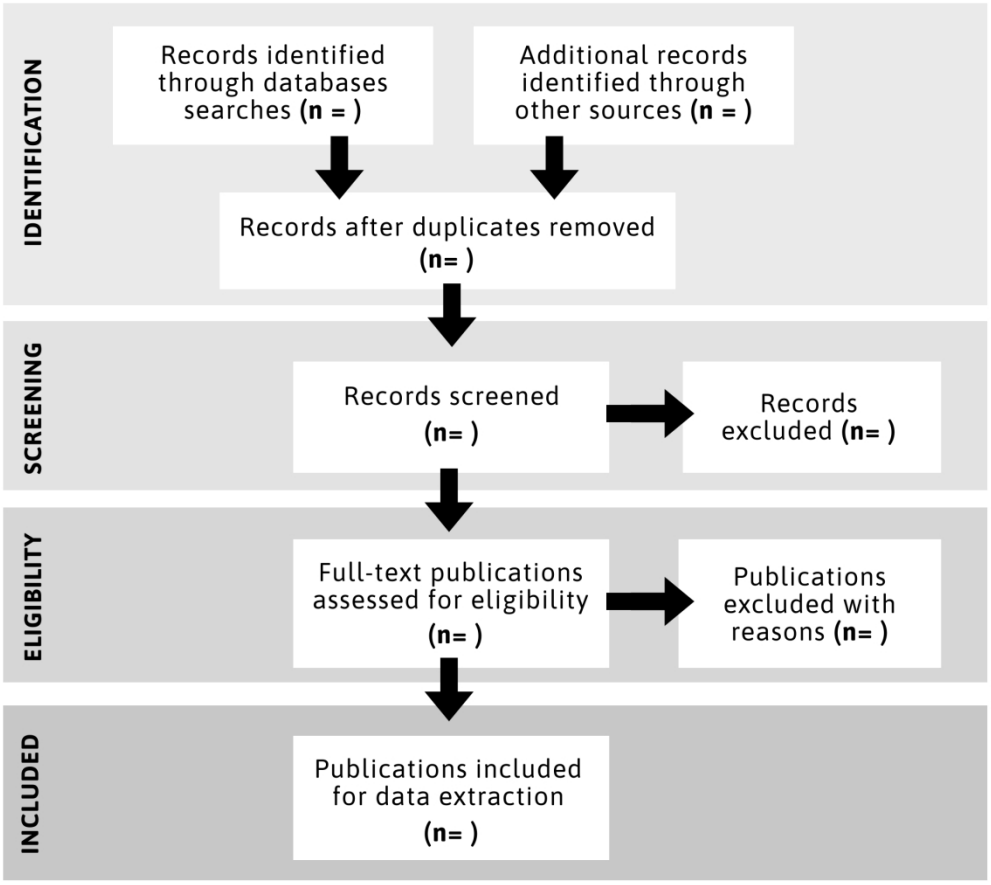
LIST OF FIGURES



Flowchart detailing identification and selection of studies for inclusion in the review

733x654mm (72 x 72 DPI)

Appendix 1| List of terms for the search strategy

TOOL Terms related to *Infographic*	PURPOSE Terms related to *Knowledge translation*
Infographic*	Health communicat*
Data visuali?ation	Information translation
Information graphic*	Knowledge translation
Visual abstract*	Knowledge transfer
Visual display	Health promotion
Visual graphic*	Health literacy
Visual presentation*	Health education
Visual stor*	Science communicat*
Datagraphic*	Scientific presentation*
Graphic* presentation*	Research disseminat*
Visual* data	Research translation
Information visuali?ation*	Research transfer
Graphic* data	Information disseminat*
Info-graphic*	Information communicat*
	Research communicat*
	Knowledge mobili?ation
	Knowledge exchange
	Knowledge broker*
	Knowledge utili?ation
	Knowledge use
	Research impact*
	Research utili?ation
	Evidence use
	Evidence-based
	Research literature
	Medical research
	Research evidence
	Research data
	Scientific knowledge
	Health information*
	Research result*
	Systematic review*
	Medical literature
	Information retention
	Information acquisition

Appendix 2 | Search strategy

Database: Ovid MEDLINE(R) <1946 to present>

Searched online : 21/07/2020

Keywords (title and abstract) :

Search results: 656

((research adj2 literature).ab,ti. OR (medical adj2 research).ab,ti. OR (research adj2 evidence).ab,ti. OR (research adj2 data).ab,ti. OR (scientific adj2 knowledge).ab,ti. OR (health adj2 information*).ab,ti. OR (research adj2 result*).ab,ti. OR (systematic adj2 review*).ab,ti. OR (medical adj2 literature).ab,ti. OR (information adj2 retention).ab,ti. OR (information adj2 translation).ab,ti. OR (knowledge adj2 translation).ab,ti. OR (knowledge adj2 transfer).ab,ti. OR (health adj2 promotion).ab,ti. OR (health adj2 literacy).ab,ti. OR (health adj2 education).ab,ti. OR (health adj2 communicat*).ab,ti. OR (science adj2 communicat*).ab,ti. OR (scientific adj2 presentation*).ab,ti. OR (research adj2 disseminat*).ab,ti. OR (research adj2 translation).ab,ti. OR evidence-based.ab,ti. OR (evidence adj2 "use").ab,ti. OR (knowledge adj2 mobili?ation).ab,ti. OR (knowledge adj2 exchange).ab,ti. OR (knowledge adj2 broker*).ab,ti. OR (knowledge adj2 utili?ation).ab,ti. OR (knowledge adj2 "use").ab,ti. OR (research adj2 impact*).ab,ti. OR (research adj2 utili?ation).ab,ti. OR (research adj2 transfer).ab,ti. OR (information adj2 disseminat*).ab,ti. OR (information adj2 communicat*).ab,ti. OR (research adj2 communicat*).ab,ti. OR (information adj2 acquisition).ab,ti. OR Health Communication/ OR Information Dissemination/ OR Health Promotion/) **AND** ("infographic*".ab,ti. OR (data adj2 visuali?ation).ab,ti. OR (information adj2 graphic*).ab,ti. OR (visual adj2 abstract*).ab,ti. OR "datagraphic*".ab,ti. OR (visual adj2 display).ab,ti. OR (visual adj2 graphic*).ab,ti. OR (visual adj2 presentation*).ab,ti. OR (visual adj2 stor*).ab,ti. OR (graphic* adj2 presentation*).ab,ti. OR (information adj2 visuali?ation*).ab,ti. OR (visual* adj2 data).ab,ti. OR (graphic* adj2 data).ab,ti. OR "info-graphic*".ab,ti. OR data visualization/)