Research in Social and Administrative Pharmacy 20 (2024) 506–511

Contents lists available at ScienceDirect

Research in Social and Administrative Pharmacy

journal homepage: www.elsevier.com/locate/rsap

Orignial Research

# Mapping the concept of health care integration: A lexicographic analysis of scientific literature

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ARTICLE INFO

*Keywords:*
Delivery of health care
Integrated
Terminology as topic
Publications
Periodicals as topic

ABSTRACT

*Background:* Systems fragmentation is a major challenge for an efficient organization, integration being a potential solution also proposed in health care field, including pharmacy as a player. However, the use of different terms and definitions in the literature hinders the comparison of different integration initiatives.
*Objective:* To identify and map the terms used in scientific literature regarding integration in health care and to characterize each emerging topic.
*Methods:* A lexicographic analysis of the integration of healthcare systems literature indexed in PubMed was conducted. Ten different systematic searches, four using only Medical Subject Headings (MeSH) and six using text words, were conducted in March 2023. Journal scattering was analyzed following Bradford's distribution using the Leimkuhler model. An overall text corpus was created with titles and abstracts of all the records retrieved. The corpus was lemmatized, and the most used bigrams were tokenized as single strings. To perform a topic modeling, the lemmatized corpus text was analyzed using IRaMuTeQ, producing descending hierarchic classification and a correspondence analysis. The 50 words with higher chi-square statistics in each class were considered as representative of the class.
*Results:* A total of 42,479 articles published from 1943 to 2023 in 4469 different journals were retrieved. The MeSH "Delivery of Health Care, Integrated", created in the 1996 MeSH update, was the most productive retrieving 33.7 % of the total articles but also retrieving 22.6 % of articles not retrieved in any other search. The text word "Integration" appeared in 15,357 (36.2 %) records. The lexicographic analysis resulted in 7 classes, named as: Evidence and implementation, Quantitative research, Professional education, Qualitative research, Governance and leadership, Clinical research, and Financial resources. Association between the classes and the searches or the text-words used ranged from moderate to weak demonstrating the lack of a standard pattern of use of terms in literature regarding healthcare integration.
*Conclusions:* The term "integration" and the MeSH "Delivery of Health Care, Integrated" are the most used to represent the concept of integration in healthcare and should be the preferred terms in the literature.

## 1. Introduction

Factors in health care systems driving current challenges include the steady increase of chronic diseases, an ageing population, the rapid transfer of infectious pathogens, population conflicts, antimicrobial resistance, the health impacts of climate change, environmental pollution, and inadequate human resources amongst others.[1,2] The fact that the COVID-19 pandemic[3] placed additional substantial stresses on

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https://doi.org/10.1016/j.sapharm.2024.01.013
Received 8 May 2023; Received in revised form 29 December 2023; Accepted 25 January 2024
Available online 6 February 2024

health care systems worldwide has been well documented.[4] Health care systems should evolve using these challenges as positive drivers for change management. In addition, the increasing specialization of health care professionals and the proliferation of specialist centers, if not carefully addressed, may place additional pressure, and produce further fragmentation of health care systems with potential negative consequences for patient care.

Integration of health care systems has been proposed as one of the possible solutions to address the aforementioned challenges and is an emerging topic in public policy discourses and practices.[5–7] Within this debate, community pharmacy emerges as a potential component of integration, an essential health agent that, if effectively integrated, could significantly contribute to improving patient outcomes and overall health care delivery.[8,9] Community pharmacies, as accessible points of care within local communities, play a crucial role in health care. Integrating these pharmacies can leverage their unique position to improve patient-centered care, medication management, and preventive health services.[8,9]

However, integration is a polysemic concept used and abused for many years,[10] with several definitions being available and used.[5,11] It is also an ambiguous concept, often used interchangeably and inconsistently with other terms such as collaboration, coordination, cooperation, integrated care or interprofessional care,[12–14] which increases the complexity and confusion in the literature.[15] All these terms are frequently used in figurative language without cognizance of definitional limitations or appropriateness.[16] This paper adopts the World Health Organization's definition of integration, "a coherent set of methods and models on the funding, administrative, organizational, service delivery and clinical levels designed to create connectivity, alignment and collaboration within and between the cure and care sectors".[5]

Terminological conflicts are frequent in low consensus scientific fields with pharmacy practice being a clear example.[17] These terminological disputes weaken evidence[18] and hinder the use and implementation of research outputs. Standardizing terminology is a requirement in the scientific literature,[19] allowing comparison of study findings and ultimately their implementation in routine practice. The absence of standardized terminology introduces an additional layer of complexity to synthesis gathering exercises by complicating literature retrieval. The use of non-standardized terms poses the risk of overlooking pertinent papers during evidence gathering, as they may not be retrieved in systematic searches.[20] Given the inconsistency and confusion surrounding integration term, there is a need to consolidate the different terms for consistent use within scientific community, ensuring a clear understanding of the implications of each study.

To address this challenge, a lexicographic analysis, a technique used for mapping terms has been chosen. Literature mapping is a technique not only used to identify research areas, researchers' activity, and journal scope,[21] but also to depict relationships between various elements of knowledge.[22] Lexicographic analysis is a mapping technique, based on content analyses performed on a text corpus, which has been previously used in pharmacy literature.[23] Lexicographic analysis has been used as a mapping technique in various fields, particularly in the context of sorting and organizing information, as it simplifies the comparison between different elements without the need of complex algorithms, which is valuable in various applications such as databases.[23,24] It also offers a standardized way to represent and compare data, particularly valuable in applications where consistency is crucial.

The objective of this study was to identify and map the terms used in scientific literature regarding integration in health care and to characterize each emerging topic.

## 2. Methods

As part of a meta-research[25] exercise, a lexicographic analysis of the literature indexed in PubMed on integration of health care systems was conducted in March 2023. PubMed was selected as database for the analysis because of three reasons: a) PubMed is the most used bibliographic database in biomedical field; b) PubMed is a non-commercial database, curated by the National Library of Medicine (NLM); and c) PubMed includes MEDLINE, which uses the best thesaurus of controlled vocabulary, the Medical Subject Headings (MeSH).[26]

### 2.1. Text corpus preparation

Papers were selected by merging 10 different systematic searches performed in PubMed, with four searches using only NLM Medical Subject Headings (MeSH) and the remaining six searches using only free text words used in the title or abstract (TIAB) of indexed articles. The free text terms used were selected by the research team as terms commonly used in literature about the topic, regardless of team opinions on their appropriateness. MeSH terms were selected in the MeSH database (https://www.ncbi.nlm.nih.gov/mesh/) as those containing the free text terms in the term or the definition. A detailed description of the ten searches is available in Table 1.

The ten searches were conducted separately, and the records were imported in ten different EndNote files (Clarivate, London, UK). The four searches based on MeSH terms were merged into an EndNote file (MeSH file), and the six searches based on free-text words were merged into an EndNote file (TIAB file). Finally, all the searches were merged into a single EndNote file.

Text contained in the titles and the abstracts of the records retrieved were merged into a consolidated block of text named as 'raw corpus' text, which was then cleaned step by step. Punctuation and capital letters were eliminated using R/RStudio (Posit, Boston, MA) with Kurt Hornik's NLP package (https://cran.r-project.org/package=NLP), obtaining a new block of text called 'clean corpus' text. To normalize the text and group together inflected or different forms of a word, the clean corpus was lemmatized using R/RStudio with Tyler Rinker's textstem package (https://cran.r-project.org/package=textstem). Lemmatization is a technique that involves reducing words to their root form, known as lemma. Subsequently, stop-words (meaningless words) were eliminated using R/RStudio using the David Muhr's stopwords package (https://cran.r-project.org/package=stopwords) based on the ISO 639-1 set of stop words, finally resulting in a new block of text now called 'lemmatized corpus' text.

To finalize the text corpus preparation, a n-gram analysis was conducted using R/RStudio and Julia Silge's tidytext package (https://cran.r-project.org/package=tidytext). Initially, a list of the most frequent bigrams (pairs of consecutive words in a sequence of text) was created. The bigrams were analyzed to identify bigrams with a different meaning to its two constituting words. These meaningful bigrams were tokenized (converted into one string by substituting the blank by an underscore) in the 'lemmatized corpus'.

### 2.2. Data analysis

Descriptive analyses of the records retrieved were performed. Journal scattering, dispersion of journals where articles were published, was analyzed following Bradford's law[27] using two different models to identify the 'nucleus' (core group of journals publishing the greatest number of articles). Firstly, an equal-size group model was used to constitute three groups close to 33 % of the total and secondly the Leimkuhler model was applied.[28] This model proposed that the three groups described by Bradford as:

$$R(r) = a * \ log(1+3b) = \frac{Y}{\log K} * \log\left(1 + 3\frac{K-1}{r_0}\right)$$

where: R(r) is the total number of articles identified; $r_0$ is the number articles in the Bradford's nucleus; and K is Bradford's constant, which can be calculated following Egghe[29] recommendations as:

**Table 1**
Results of the 10 searches performed to retrieve articles about integration of health care (total articles retrieved = 42,479).

| | | Search 1 | Search 2 | Search 3 | Search 4 | Search 5 | Search 6 | Search 7 | Search 8 | Search 9 | Search 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Articles retrieved (%) | | 590 (1.4) | 2453 (5.8) | 14,298 (33.7) | 2955 (7) | 7524 (17.7) | 5883 (13.8) | 6837 (16.1) | 4243 (10) | 1026 (2.4) | 2497 (5.9) |
| Exclusive articles (%) | | 519 (1.2) | 2227 (5.2) | 11,285 (26.6) | 2608 (6.1) | 5862 (13.8) | 4577 (10.8) | 4088 (9.6) | 3683 (8.7) | 922 (2.2) | 1520 (3.6) |
| | | First search | | | | | | | | | |
| | | Search 1 | Search 2 | Search 3 | Search 4 | Search 5 | Search 6 | Search 7 | Search 8 | Search 9 | Search 10 |
| | | Number of articles retrieved in first search and second search (percentage of articles retrieved in second search also retrieved in first search) | | | | | | | | | |
| Second search | Search 1 | – | 0 | 44 (0.3) | 15 (0.5) | 1 (<0.1) | 7 (0.1) | 4 (0.1) | 4 (0.1) | 0 | 1 (<0.1) |
| | Search 2 | 0 | – | 48 (0.3) | 6 (0.2) | 141 (1.9) | 14 (0.2) | 24 (0.4) | 19 (0.4) | 5 (0.5) | 20 (0.8) |
| | Search 3 | 44 (7.5) | 48 (2.0) | – | 112 (3.8) | 254 (3.4) | 722 (12.3) | 2061 (30.1) | 189 (4.5) | 12 (1.2) | 50 (2.0) |
| | Search 4 | 15 (2.5) | 6 (0.2) | 112 (0.8) | – | 177 (2.4) | 30 (0.5) | 21 (0.3) | 7 (0.2) | 12 (1.2) | 21 (0.8) |
| | Search 5 | 1 (0.2) | 141 (5.7) | 254 (1.8) | 177 (6.0) | – | 159 (2.7) | 266 (3.9) | 106 (2.5) | 34 (3.3) | 803 (32.2) |
| | Search 6 | 7 (1.2) | 14 (0.6) | 722 (5.0) | 30 (1.0) | 159 (2.1) | – | 533 (8.1) | 110 (2.6) | 9 (0.9) | 55 (2.2) |
| | Search 7 | 4 (0.7) | 24 (1.0) | 2061 (14.4) | 21 (0.7) | 266 (3.5) | 553 (9.4) | – | 220 (5.2) | 10 (1.0) | 75 (3.0) |
| | Search 8 | 4 (0.7) | 19 (0.8) | 189 (1.3) | 7 (0.2) | 106 (1.4) | 110 (1.9) | 220 (3.2) | – | 6 (0.6) | 49 (2.0) |
| | Search 9 | 0 | 5 (0.2) | 12 (0.1) | 12 (0.4) | 34 (0.5) | 9 (0.2) | 10 (0.1) | 6 (0.1) | – | 33 (1.3) |
| | Search 10 | 1 (0.2) | 20 (0.8) | 50 (0.3) | 21 (0.7) | 803 (10.7) | 55 (0.9) | 75 (1.1) | 49 (1.2) | 33 (3.2) | – |
| | | Number of articles retrieved both in first and second search (percentage of articles retrieved in first search also retrieved in second search) | | | | | | | | | |

Search 1. MeSH: “Systems Integration"[MH] AND “Professional Practice"[MH].
Search 2. MeSH: “Intersectoral Collaboration"[MH].
Search 3. MeSH: “Delivery of Health Care, Integrated"[MH].
Search 4. MeSH: “Cooperative Behavior"[MH] AND “Professional Practice"[MH].
Search 5. (Collaboration): “interprofessional collaboration"[TIAB] OR “collaborative care"[TIAB] OR “collaborative practice"[TIAB].
Search 6. (Integration): “integration professional"[TIAB:~3] OR “integration care"[TIAB:~3].
Search 7. (Integrated care): “integrated care"[TIAB].
Search 8. (Coordination): “coordination professionals"[TIAB:~3] OR “coordination practice"[TIAB:~3] OR “coordinated practice"[TIAB:~3] OR “coordinated care"[TIAB:~3].
Search 9. (Cooperation): “cooperation professional"[TIAB:~3] OR “cooperation interprofessional"[TIAB:~3] OR “cooperative care"[TIAB:~3].
Search 10. (Interprofessional care): “interprofessional care"[TIAB:~3].

$$K = (e^{y} * y_{m})^{\frac{1}{3}}$$

where γ is Euler’s constant ($e^{y}$ equals to 1.781).

The effectiveness of each search was analyzed by assessing its overlap, defined as the number of records retrieved by two searchers, and its exclusiveness, defined as the number of records retrieved in a search that were not retrieved in any other search. Records retrieved with each search strategy were plotted to depict time trends.

Word co-occurrence, defined as the simultaneous occurrence of two words in any position of the conglomerate of title and abstract, was analyzed with R/RStudio using tidytext package. Most frequent co-occurrences were plotted with Thomas Lin Pedersen’s ggrapgh package (https://cran.r-project.org/package=ggraph).

To perform a topic modeling, the lemmatized corpus text was analyzed using IRaMuTeQ 0.7 alpha 2 (Lerass, Toulouse). Similarly to Mendes et al.,[23] a descending hierarchic classification was conducted to categorize active (meaningful) words into similar lexical groups (i.e., topics) named as classes. The 50 words with higher chi-square statistics in each class were considered as representative of the class. The resulting classes were named, according to these 50 class representative words, by consensus among the authors. A bidimensional plot depicting the classes and their spatial configuration was conducted by means of a correspondence analysis.

The number of words contained in the title or abstract that corresponded to the 50 class-representative words was calculated for each article. These numbers were presented as the percentage of words of each class from the total words in titles and abstracts. These percentages represent the proportion of words of each class in the titles and abstracts and, the proximity of each article to each class. Medians and interquartile ranges (IQR) of the distributions of these percentages were calculated for the articles retrieved in each search strategy. The percentage of class representative words obtained in each search was compared with percentage of these words in the remaining records using the Mann-Whitney test. To avoid the effect of the huge sample in the null effect test, and to comply with American statistical Association recommendations,[30] Cohen’s d was calculated for each analysis using Psychometrica calculator (www.psychometrica.de). Effect size was classified following Cohen’s recommendations[31] into: <0.2 null effect; 0.2–0.5 small effect; 0.5–0.8 intermediate effect; and >0.8 large effect. A similar calculation was done with the list of highly relevant words identified as meaningful terms around the concept of integration, including the constructs comprising the concept[16]: integration, integrated care, collaboration, coordination, cooperation, interprofessional care, communication, trust, connectivity, consensus, co-location, and relationship.

## 3. Results

A total of 42,479 different articles were retrieved, whose distribution is shown in Table 1. From these, 3264 (7.7 %) were retrieved both in MeSH searches and TIAB searches, 16,809 (39.6 %) only in MeSH searches, and 22,406 (52.7 %) only in TIAB searches. The most productive search was using the MeSH “Delivery of Health Care, Integrated”, not only retrieving 33.7 % of total articles, but also retrieving 22.6 % of articles not retrieved in any other search. The greatest overlap between a single MeSH search and a TIAB search occurred between the MeSH “Delivery of Health Care, Integrated” and the text word ‘integrated care’ (Table 1).

Articles were published from 1943 to 2023 in 4469 different journals, with 1492 journals publishing only one article. Bradford’s scattering nucleus, which represents the number of journals concentrating higher number of articles published about integration, was constituted by 111 journals following the equal size group model and 13 following Leimkuhler model. Appendix 1 provides the detail of both model calculations. The median publication year was 2015 (IQR 2008:2019). The several searches used presented different time trends (Appendix 2). The MeSH “Delivery of Health Care, Integrated”, created in the 1996 MeSH update, was highly used since its inception, although with a slight negative trend (figure A, Appendix 2). The four MeSH searches demonstrated a clear decrease in their use in the last four years, while text word searches (TIAB searches) have been steadily increasing the retrieval effectiveness since 2000. Figure B on Appendix 2 presents the evolution of articles retrieved with the compilation of MeSH searches and the compilation of text word searches, showing the drastic increase

in MeSH searches produced by the creation of the MeSH "Delivery of Health Care, Integrated", but also the drastic decrease associated to the summation of the decreases in the use of that MeSH and the MeSH "Intersectoral Collaboration". Since 2011, the efficacy of the text word searches surpassed the MeSH searches.

Frequency of the 12 selected highly relevant words among the 42,479 titles and abstracts was: 'integration' (n = 15,357), 'collaboration' (n = 9409), 'integrated care' (n = 7126), 'coordination' (n = 5416), 'communication' (n = 4041), 'relationship' (n = 3155), 'cooperation' (n = 1891), 'consensus' (n = 924), 'trust' (n = 870), 'interprofessional care' (n = 514), 'colocation' (n = 140), 'connectivity' (n = 65). The use of these terms was not constant through time (Fig. 1). The articles containing the word 'integration' were the most prevalent and experienced a drastic increase in 1993. 'Collaboration' and 'integrated care' were also highly used, both with an important increase in the past decade. The most common bigrams are presented in Appendix 3. The most prevalent word co-occurrence per article is depicted in Fig. 2, where 'care' showed the highest centrality and high co-occurrence with a few words, including 'integrated'. Among the list of highly relevant words, only 'integration', 'integrated' and 'collaborative' appear in the co-occurrence network.

Lexicographic analysis of the text corpus comprising the 42,479 titles and abstracts (when available) resulted in 7 classes, defined as: #1 Evidence and implementation, #2 Quantitative research, #3 Professional education, #4 Qualitative research, #5 Governance and leadership, #6 Clinical research, and #7 Financial resources. Structure resulting from the hierarchic cluster analysis is presented in Appendix 4, showing that classes #1 and #5 were last to be separated. Correspondence analysis of the words constituting the seven classes is presented in Fig. 3, where the overlap between class #1 and #5 is evident. The 50 more frequent words of articles pertaining to these 7 classes are also presented in Appendix 4.

Appendix 5 presents the association between the seven classes and the articles retrieved in each of the 10 searches. Most of the searches demonstrated no association with most of the classes, except a strong association between class #7 (i.e., Financial resources) and search #2 (i.e., Intersectoral collaboration), and a moderate effect between class #3 (i.e., Professional education) and searches #5 (i.e., Collaboration) and #10 (i.e., Interprofessional care) as well as between class #2 (i.e., Quantitative research) and search #7 (i.e., Integrated care).

Appendix 6 also presents the association between the seven classes and the highly relevant words. A strong association was found between class #3 (i.e., Professional education) and the word 'collaboration', and moderate association also between class #5 (i.e., governance and leadership) and the word 'integration' and between class #2 (i.e., quantitative research) and 'integrated care'.

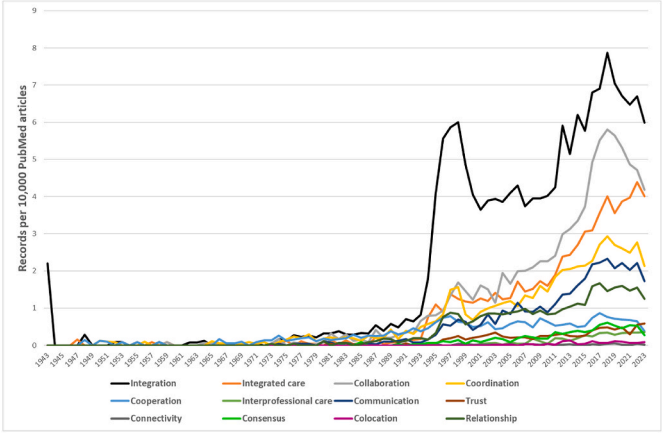


**Fig. 1.** Utilization time trends of the highly relevant words (meaningful terms around integration).

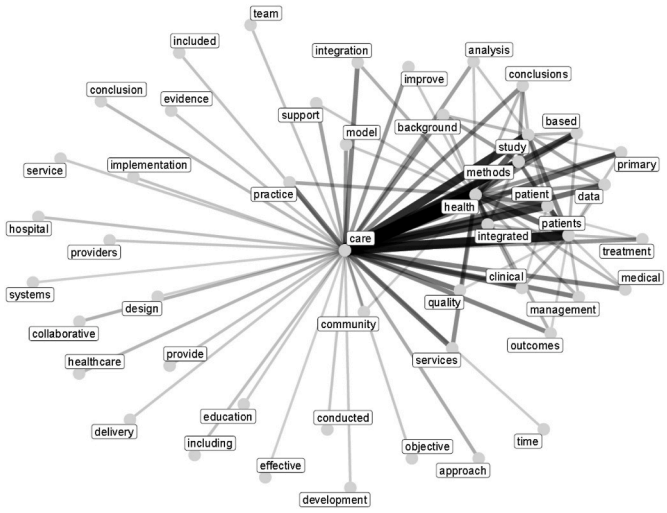


**Fig. 2.** Co-occurrence of words in text corpus constituted by the 42,479 titles and abstracts (when available). Edge size represent the co-occurrence frequency.

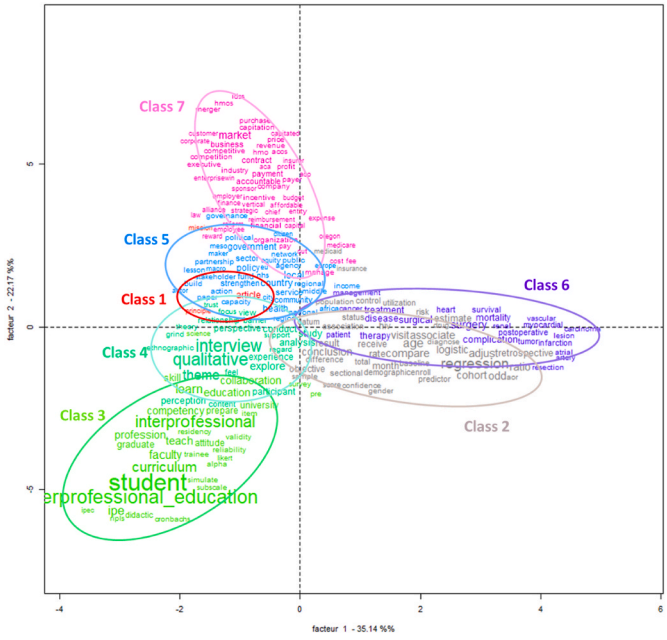


**Fig. 3.** Correspondence analysis of the text corpus resulting in 7 classes: #1 Evidence and implementation, #2 Quantitative research, #3 Professional education, #4 Qualitative research, #5 Governance and leadership, #6 Clinical research, and #7 Financial resources.

## 4. Discussion

After mapping the text contained in 42,479 articles retrieved with 10 different systematic searches around the concept of integration in health care, the relationship between the seven sub-areas (i.e., classes) covering the concept were identified. A complex concept map with unstandardized terms emerged. The use of text words and MeSH terms varied through years, but no clear association with the overall concept of integration or the 7 sub-areas was found. This mapping exercise may be useful to clarify and lead to the use of appropriate terminology about integration in health care.

As has occurred in previous mapping exercises, the lack of term standardization could be the consequence of the journal dispersion. Publication scattering, that happens when authors scatter their articles

about one topic among a great number of journals, instead of concentrating them in specialized (i.e., dedicated) journals, was identified as a common practice in areas from psychology[32] to environmental sciences,[33] and in pharmacy.[34] In this study, more than 4000 journals from different disciplines and scopes were used to publish the 42,000 articles, with few journals being highly productive. The different background of the editorial boards and the reviewers used in these journals will bring their own limitations and bias thus confounding the standardization of terminology in the editorial processes.[35]

The use of various terms and definitions could be attributed to the differences in health care systems.[36] The lack of a commonly agreed definition and terminology for health care integration was described as a barrier to measure and compare integration outcomes.[11,37] The absence of standardized terminology creates an additional difficulty to the synthesis gathering exercises by complicating systematic searches.[20] A systematic search should include, in addition to the appropriate MeSH terms, all the free-text words that could be used to describe the concept being searched. Using unstandardized terms brings the risk of papers being missed in evidence gathering, as they would not be retrieved in systematic searches. In this mapping exercise, the low overlapping and the relevant exclusivity among searches indicated that the 10 searches were necessary to comprehensively retrieve the body of literature on integration in health care. Using keywords from controlled vocabularies, such as the NLM Medical Subject Heading (MeSH), increases the efficiency of systematic searches.[38] However, MeSH are created by MeSH staff after a consistent use of terms in literature.[19] In this study, the MeSH "Delivery of Health Care, Integrated" provided the best results but retrieved only 34 % of the articles, with a negative trend over time. Further analyses should identify potential MeSH terms that appropriately catalog the literature about integration.

The complexity in terminology may be in part originated because of the slightly different concepts included the several sub-areas of the topic. Nevertheless, several natural language processing and topic modeling techniques are useful to identify the factors emerging from a text.[39] The factorial structure of the health care integration area showed that the seven factors (classes) are distributed in three regions, with the three research classes (i.e., qualitative research, clinical research, and quantitative research) closely related; another three factors representing a policy component (i.e., governance & leadership, evidence & implementation, and financial resources). In most cases, these factors were not associated to specific searches or words which suggests that there is no logical reason to support the use of different terms for quite similar concepts that are equally distributed among all the factors. Only the MeSH "Intersectoral Collaboration" was strongly associated to the 'Financial resources' factor, perhaps because this MeSH was situated under the "Health Services Administration" branch of the MeSH thesaurus. Another strong association was found between the word "collaboration" and class #3 (i.e., Professional education), which may result from the relative importance of one of the constructs[16] of the concept (i.e., collaboration) on the educational activities promoting integration. An intermediate association existed between the word "integration" and the "Governance and leadership", probably because the word integration is being commonly used by policymakers to describe the necessity of the joint work in health systems.[40–42]

Among the 12 terms relevant to this mapping exercise, the term 'integration' was not only the most prevalent in the 42,479 titles and abstracts, but also the term with a more evident positive trend over time. Interestingly, in the past decade there has been a rapid growth in the use of the term 'integrated care'. This coincides with the highest prevalence of the MeSH "Delivery of Health Care, Integrated", created by NLM in 1995, two years after the explosion of the term 'integration' in the literature. It appears that integration could be the preferred term that binds separate but interconnected topic components together.[43] The literature describes integration as a continuum of different stages including collaboration and coordination.[44–48] It could be argued that integration implies incorporation of different components into a unique system. However, there are examples of public-private integration processes which do not require a single entity as an outcome. Keeping public-private components separated[49] is possible as integration represents the extent to which functions and activities can be appropriately managed across operating units, regardless of their location, ownership, or other physical characteristics.[50]

Mapping the concept of integration has been useful in discerning the different sub-areas where the overall concept is divided and determining which terms (free text words or MeSH) should be used in any future systematic search aiming to gather evidence about integration in health care. However, further research is required to refine the query and achieve the optimal search strategy, especially when taking into consideration the weak or null association between MeSH terms or free text words presented with the 7 classes (sub-areas of the integration literature). Other future studies should identify if currently existing MeSH terms have been appropriately assigned to articles about integration. In the meanwhile, authors should consider using the MeSH terms identified in this study as text in their abstracts, allowing a better indexing by automatic systems. Also, future studies could investigate if new MeSH terms to differentiate the sub-areas could be suggested depending on the most frequently used free text terms in each class.

### 4.1. Limitations

As in any mapping exercise, this study analyzed the literature obtained after a series of systematic searches. Although a corpus comprising more than 42,000 articles was obtained, some concepts might have been omitted in the conglomerate of searches as they were performed using only PubMed as a source, thus missing articles from journals not indexed in the NLM platform.

## 5. Conclusion

Using a lexicographic analysis, the literature about health care integration was mapped, showing a seven-factor structure. The term "integration" and the MeSH "Delivery of Health Care, Integrated" are the most used to represent the concept and should be preferred terms in the literature. Mapping exercises proved useful to reduce terminological disputes and to standardize terminology. As pharmacy further endeavors to integrate into healthcare systems and be part of healthcare teams, the use of consistent and standardized terminology will become an important element to focus, not only for political debate, but to make full use of the limited resources allocated to research.

## Funding

This research was funded by the University of the Basque Country (US20/08) and Cinfa laboratories for the PhD scholarship.

## CRediT authorship contribution statement

**Amaia Urionagüena:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Celia Piquer-Martinez:** Investigation, Writing – review & editing. **Shalom Isaac Benrimoj:** Conceptualization, Supervision, Writing – original draft, Writing – review & editing. **Begoña Calvo:** Funding acquisition, Supervision, Writing – review & editing. **Victoria Garcia-Cardenas:** Investigation, Writing – review & editing. **Miguel Angel Gastelurrutia:** Funding acquisition, Supervision, Writing – review & editing. **Fernando Martinez-Martinez:** Investigation, Writing – review & editing. **Fernando Fernandez-Llimos:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing.

## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Amaia Urionaguena reports financial support was provided by University of the Basque Country. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sapharm.2024.01.013.

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