Research Article

Healthcare Risk Management Analysis – A Bibliometric Approach

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Abstract

Using a large-scale dataset from WoS, this paper explores the publications on healthcare risk management, through bibliometric analysis. The bibliometric analysis reflects how research in hospital risk management and healthcare management evolved over time, offering insights on the most relevant and influential research. Based on the idea that researchers publish their most important results in articles, conferences, books and reviews, there is diffusion in this research field, with many reference countries. The bibliometric analysis reflects the growing interest of research for the area of healthcare risk management. The need to provide high quality medical services requires the design and implementation of a set of key performance indicators for each strategic objective set by the hospital management.

Keywords: hospital risk management, bibliometric indicators, citation analysis, healthcare.

Introduction

Pritchard Alan (1969), invented the term of bibliometrics, by using it to denote the utilization of mathematical and statistical methods for analysis of written publications. Bibliometrics are used in quantitative research assessment, using key performance indicators for the quality of the research activity. Bibliometrics, or Scientometrics, represents a quantitative analysis method, a statistical technique for journal articles, proceedings papers, reviews, books and their citation counts. The quantitative analysis consists in measuring, recording, computing and analyzing the research results worldwide (Merigo et al., 2015).

The knowledge accumulated over time in the hospital risk management and healthcare fields became more and more complex, requiring new methods and analysis techniques for the decision

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making process (Tsay M., 2015). Quality and performance assessment in universities, government and researchers is realised with the help of bibliometrics. According to Fetscherin M., Heinrich D. (2015), the citation counts illustrate the relevance, utility and impact of certain papers, the citation analysis pointing if a paper is in top in a specific area of interest. Bibliometrics are used in different areas of studies, from science and humanities to social sciences.

The data source used is Web of science (WoS) of Thomson&Reuters. This database includes more than 160.000 papers, from 250 disciplines and visualizes, analyzes and integrates research papers and citation metrics from 1900. It is a reliable database of reference for the university community, including innovative research with a high degree of originality (Delcea, 2014; Cotfas, 2013).

Hospital risk management is a major concern for risk managers to provide better quality in healthcare. Risks that may occur in a hospital are often interconnected, of utmost importance is determining how these risks affect the appearance of other risks. If the hospital is facing more risks, the risk exposure is increasing, causing vulnerability. (Delcea et al., 2014) According to Bradea et al., (2014), the risks that affect a hospital can be classified into seven categories, namely: mismanagement risk, inability to engage patients risk, technological risk, hospital conditions risk, human resource risk, clinical risk, cyber security and confidentiality of information risk, inadequate funding risk and regulatory issues risk.

Hospital Risk Management: A Bibliometric Overview

The WoS database consists in Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI), Conference Proceedings Citation Index- Science (CPCI-S) and Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH), that register papers originated from 1900.

To develop the search process we have used the keywords: hospital, healthcare and risk and have been provided with the papers related to this field of interest. The search for these three keywords generated 17044 results. After that, there were obtained 65,049 results for hospital risk management and 1192 results for healthcare risk management.

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☐ GENERAL INTERNAL MEDICINE (210)	☑ EMERGENCY MEDICINE (13)	☑ SOCIAL ISSUES (2)
☑ HEALTH CARE SCIENCES SERVICES (143)	☐ TOXICOLOGY (12)	☐ REPRODUCTIVE BIOLOGY (2)
☑ INFECTIOUS DISEASES (141)	☐ SCIENCE TECHNOLOGY OTHER TOPICS (11)	☐ RADIOLOGY NUCLEAR MEDICINE MEDICAL IMAGING (2)
☑ PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH (125)	☐ PSYCHOLOGY (11)	☐ PATHOLOGY (2)
☐ CARDIOVASCULAR SYSTEM CARDIOLOGY (99)	☐ RHEUMATOLOGY (10)	☐ GENETICS HEREDITY (2)
☐ PHARMACOLOGY PHARMACY (83)	☐ HEMATOLOGY (10)	☐ FAMILY STUDIES (2)
☑ NURSING (60)	☐ BIOMEDICAL SOCIAL SCIENCES (10)	☐ DENTISTRY ORAL SURGERY MEDICINE (2)
☑ SURGERY (55)	☐ TROPICAL MEDICINE (9)	☑ CONSTRUCTION BUILDING TECHNOLOGY (2)
☐ ENGINEERING (53)	☐ MEDICAL LABORATORY TECHNOLOGY (9)	☐ CHEMISTRY (2)
☐ RESPIRATORY SYSTEM (42)	☑ SOCIAL SCIENCES OTHER TOPICS (8)	☐ BIOCHEMISTRY MOLECULAR BIOLOGY (2)
☐ PEDIATRICS (42)	☐ ALLERGY (8)	☐ VETERINARY SCIENCES (1)
☐ MICROBIOLOGY (36)	☑ REHABILITATION (7)	☐ THERMODYNAMICS (1)
☑ COMPUTER SCIENCE (33)	☐ OTORHINOLARYNGOLOGY (6)	☐ TELECOMMUNICATIONS (1)
☐ OBSTETRICS GYNECOLOGY (30)	☐ OPHTHALMOLOGY (5)	☑ PUBLIC ADMINISTRATION (1)
☐ ENVIRONMENTAL SCIENCES ECOLOGY (30)	☐ NUTRITION DIETETICS (5)	☐ PHYSIOLOGY (1)
☐ NEUROSCIENCES NEUROLOGY (28)	☐ DERMATOLOGY (5)	☐ PHYSICS (1)
☐ GERIATRICS GERONTOLOGY (28)	☐ WOMEN S STUDIES (4)	☐ PARASITOLOGY (1)
☑ BUSINESS ECONOMICS (27)	☐ TRANSPLANTATION (4)	☐ NUCLEAR SCIENCE TECHNOLOGY (1)
☑ MEDICAL INFORMATICS (26)	☐ INFORMATION SCIENCE LIBRARY SCIENCE (4)	☐ MYCOLOGY (1)
☐ ONCOLOGY (21)	☐ SUBSTANCE ABUSE (3)	☑ MATHEMATICAL METHODS IN SOCIAL SCIENCES (1)
☐ IMMUNOLOGY (21)	☐ SPORT SCIENCES (3)	☐ MATERIALS SCIENCE (1)
☐ RESEARCH EXPERIMENTAL MEDICINE (20)	☑ MEDICAL ETHICS (3)	☐ IMAGING SCIENCE PHOTOGRAPHIC TECHNOLOGY (1)
☐ PSYCHIATRY (20)	☐ MATHEMATICS (3)	☐ HISTORY PHILOSOPHY OF SCIENCE (1)
☐ ENDOCRINOLOGY METABOLISM (19)	☐ MATHEMATICAL COMPUTATIONAL BIOLOGY (3)	☑ GOVERNMENT LAW (1)
☐ ANESTHESIOLOGY (19)	☐ LIFE SCIENCES BIOMEDICINE OTHER TOPICS (3)	☐ FOOD SCIENCE TECHNOLOGY (1)
☐ ORTHOPEDICS (18)	☐ EDUCATION EDUCATIONAL RESEARCH (3)	☐ DEVELOPMENTAL BIOLOGY (1)
☐ GASTROENTEROLOGY HEPATOLOGY (17)	☐ WATER RESOURCES (2)	☐ CELL BIOLOGY (1)
☐ UROLOGY NEPHROLOGY (16)	☐ SOCIOLOGY (2)	☐ BIOTECHNOLOGY APPLIED MICROBIOLOGY (1)
☑ OPERATIONS RESEARCH MANAGEMENT SCIENCE (15)		

Figure. 1: The most significant research areas
Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

Most articles in this field were written after 2005, before this year only 14% from total being registered. It can be noticed that the publication number starting from 2005 to 2014 has an increasing trend, with a peak in 2014.
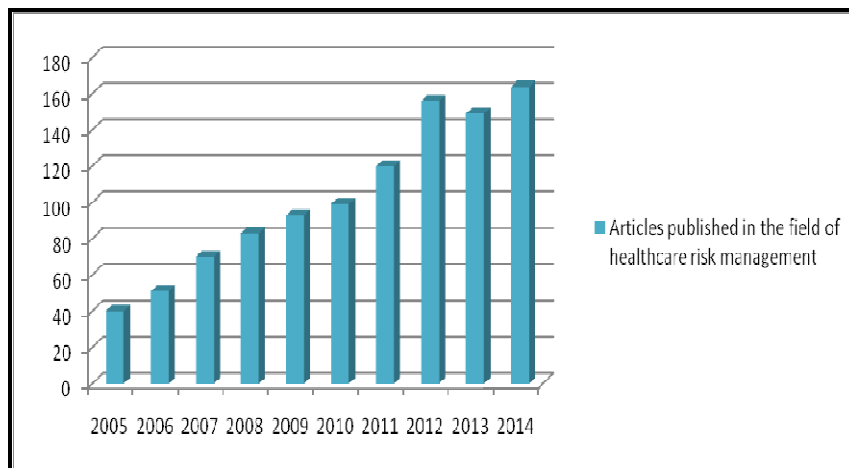

Figure. 2: The evolution of the articles published in the field of healthcare risk management
Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

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These results classify the information into 85 subject categories and research areas. From these areas of interest were selected the relevant areas for our research that targets the risks that may manifest in a hospital. Thus, after sorting from 1192 results were obtained 550 relevant papers, this bibliometric analysis being focused on the following areas:

Table 1: The research areas of the papers written on healthcare risk management

Research area	Number of papers	Percent
Healthcare sciences services	143	0,26
Infectious diseases	141	0,256364
Public Environmental occupational health	125	0,227273
Nursing	60	0,109091
Surgery	55	0,1
Computer Science	33	0,06
Medical Informatics	32	0,058182
General internal medicine	30	0,054545
Pharmacy	29	0,052727
Business Economics	27	0,049091

Source: http://thomsonreuters.com

Graphically, the articles are distributed on the research areas as in figure no. 3. Depending on the language in which they were published, the largest share is obtained by articles published in English (95.55 %), then were the French articles (1.09 %), Portuguese articles (1.09), German articles (0.73%), Italian articles (0,36%) and Spanish articles (0.18%).
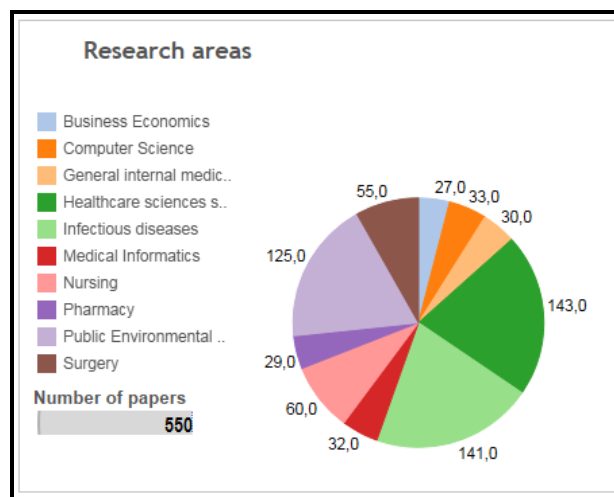
Figure. 3: The percentage of healthcare risk management articles in different research areas Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

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The year 2013 represents the apogee in terms of interest for this domain, with 78 published papers, representing 13,46 % from the total. For the other years the percents were: 2005 (3,82%), 2006 (3.82%), 2007 (6,18%), 2008 (7,64%), 2009(8,36%), 2010 (9,64%), 2011 (10,73%), 2012 (10,55%), 2013 (13,46%), 2014 (10,18%).
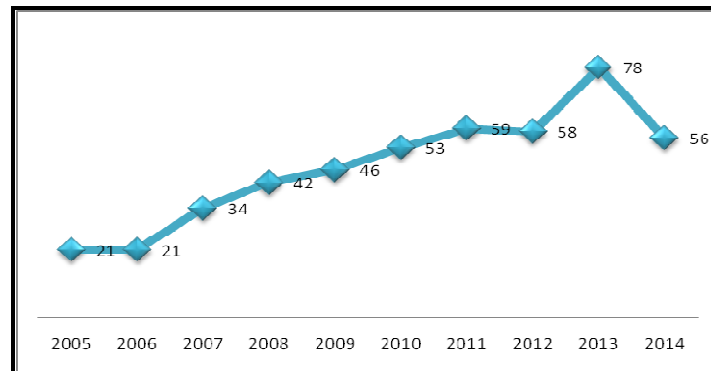
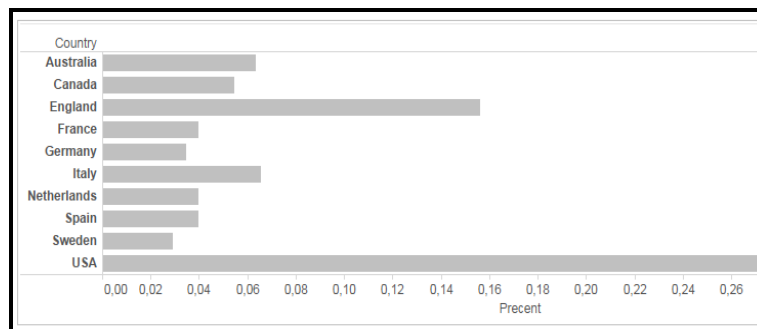

Figure. 4: Number of published papers according to year
Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

Figure. 5: Country of origin for the recorded papers
Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

In terms of geographical distribution of the authors, the most papers were from the United States of America (32.91%), followed by England (15.64%), Italy (6.55%), Australia (6.36%), Canada (5.46%), France (4%), Netherlands (4%), Spain (4%), Germany (3.46%) and Sweden (2.91%).

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Figure. 6: Country of origin for the recorded papers – A global overview
Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

Figure no. 7 presents the classification of recorded papers on healthcare risk management. Over 83% of these articles are published in ISI journals, followed by articles published in conferences proceedings (11.46%). The reviews represent around 10% of the total papers and the editorial materials account less than 1%.
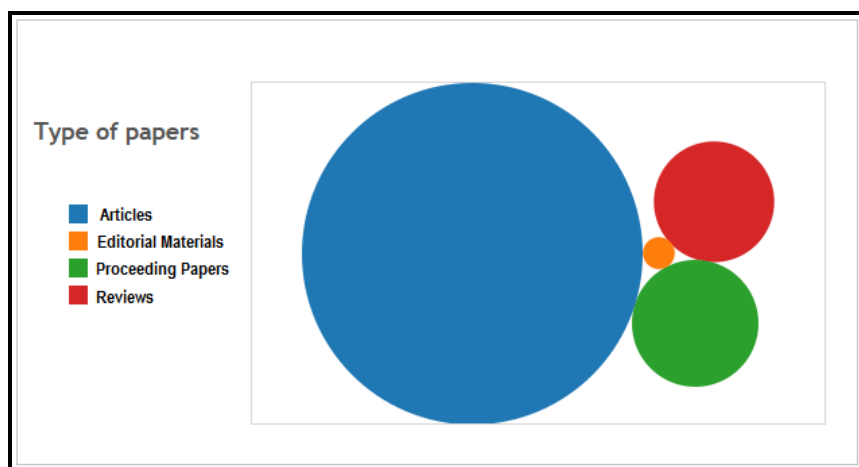

Figure. 7: Type of papers
Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

Citation Analysis

One of the most known and used method of bibliometrics, citation analysis identifies the frequency, patterns and diagrams in scientific papers. The results obtained through citation analysis are statistically notable due to the quantity of data collection. The following table illustrates the different types of citations found in WoS.

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Table 2: The citation analysis

Results found	550
Sum of the Times Cited	5473
Sum of Times Cited without self-citations	5419
Citing Articles	5223
Citing Articles without self-citations	5176
Average Citation per Item	9,95
H Index	35

Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

The h-index is a measure of the citation impact, illustrates the importance of a set of papers. The H-index is a measure for the distribution of <u>citations</u> received by a paper. The value of 35 indicates that 35 papers from a sample have 35 citations.
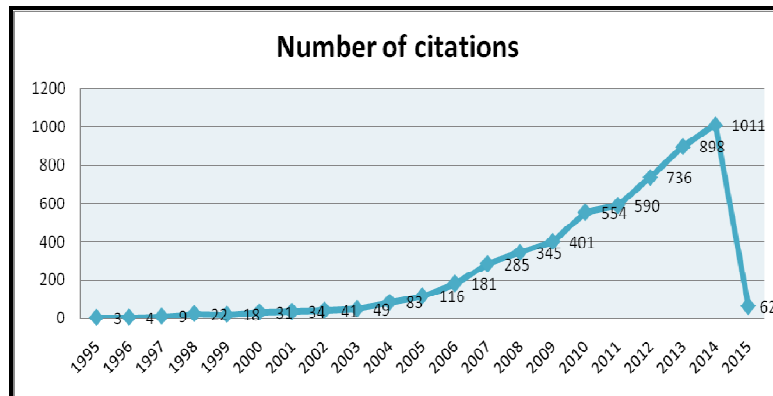
Fig. 8: Number of citations
Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

Analyzing the number of citations for healthcare risk management papers, for the period 1995-20143 it can be easily seen an upward trend, supported by the increased interest in healthcare and risk management. Because for 2015 are recorded papers until February; there is a decrease in the number of citations.

There were recorded 5473 citations and an average of 9,95 citation per paper. The most relevant article on this research area has 184 citations and 15,33 citations per year. There are 30 articles that have the value of the citation per year above 5. The most relevant papers are presented in the following table.

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Table 3: The papers on healthcare risk management

No.	Title	Authors	Year	Total citations	Citations per year
1	Systems approaches to surgical quality and safety - From concept to measurement	Vincent C., Moorthy K., Sarker S.K .et al.	2004	184	15,33
2	Rapid response to stroke symptoms: The Delay in Accessing Stroke Healthcare (DASH) study	Rosamond W.D., Gorton R.A. Hinn A.R. et al.	1998	105	5,83
3	Guidelines for UK practice for the diagnosis and management of methicillin-resistant Staphylococcus aureus (MRSA) infections presenting in the community	Nathwani D., Morgan M., Masterton R.G., et al.	2008	96	12
4	An outbreak due to multiresistant Acinetobacter baumannii a burn unit: Risk factors for acquisition and management	Simor A.E., Vearncombe M., Jones-Paul L. et al.	2002	89	6,36
5	A review of sharps injuries and preventative strategies	Trim J.C., Elliott T.S.J.	2003	83	6,38
6	Surgical site infections: epidemiology, microbiology and prevention	Owens C.D., Stoessel K.	2008	72	9
7	Prior pneumococcal vaccination is associated with reduced death, complications, and length of stay among hospitalized adults with community-acquired pneumonia	Fisman D.N., Abrutyn E., Spaude K.A., et al.	2006	71	7,1
8	Role of healthcare workers in outbreaks of methicillin-resistant Staphylococcus aureus: A 10-year evaluation from a Dutch University Hospital	Blok H.E.M., Troelstra A., Kamp-Hopmans T.E.M., et al.	2003	68	5,23
9	Nosocomial influenza in children	Maltezou H.C., Drancourt M.	2003	62	4,77
10	Pressure ulcers and their treatment and effects on quality of life: hospital inpatient perspectives	Spilsbury K., Nelson A., Cullum N., et al.	2007	59	6,56
11	Systematic review of antimicrobial drug prescribing in hospitals	Davey P., Brown E., Fenelon L., et al.	2006	59	5,9
12	Management of outbreaks of methicillin-resistant Staphylococcus aureus infection in the neonatal intensive care unit: A consensus	Gerber S.I., Jones Roderick C., Scott M.V., et al.	2006	54	5,4

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13	Managing Expert Knowledge: Organizational Challenges and Managerial Futures for the UK Medical Profession	Waring J., Currie G.	2009	53	7,57
14	Feedback from incident reporting: information and action to improve patient safety	Benn J., Koutantji M., Wallace L., et al.	2009	53	7,57
15	Surgical adverse events, risk management, and malpractice outcome: Morbidity and mortality review is not enough	Morris J.A., Carrillo Y., Jenkins J.M., et al.	2003	51	3,92
16	Treatment of multidrug resistant Acinetobacter	Murray C.K., Hospenthal D.R.	2005	50	4,55
17	Severe falciparum malaria in Gabonese children: clinical and laboratory features	Dzeing-Ella A., Obiang P.C.N., Tchoua R. et al.	2005	46	4,18
18	Laboratory tools and strategies for methicillin-resistant Staphylococcus aureus screening, surveillance and typing: state of the art and unmet needs	Struelens M.J., Hawkey P.M., French G.L., et al.	2009	45	6,43
19	Epidemiologic, clinical, and economic evaluation of an outbreak of clonal multidrug-resistant Acinetobacter baumannii infection in a surgical intensive care unit	Young L.S., Sabel A.L., Price C.S.	2007	44	4,89
20	Going solid'': a model of system dynamics and consequences for patient safety	Cook R., Rasmussen J.	2005	44	4
21	The comparative medical costs of atherothrombotic disease in European countries	Levy E., Gabriel S., Dinet J.	2003	43	3,31
22	Management of healthcare workers infected with hepatitis B virus, hepatitis C virus, human immunodeficiency virus, or other bloodborne pathogens	Henderson D.K., Chiarello L.A., Dickinson G.M., et al.	1997	43	2,26
23	Country-to-Country Transfer of Patients and the Risk of Multi-Resistant Bacterial Infection	Rogers B.A., Aminzadeh Z., Hayashi Y., et al.	2011	42	8,4
24	Nanocrystalline silver dressings as an efficient anti-MRSA barrier: a new solution to an increasing problem	Strohal R., Schelling M., Takacs M., et al.	2005	41	3,73

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25	Extended-spectrum beta-lactamase-producing Gram-negative pathogens in community-acquired urinary tract infections: an increasing challenge for antimicrobial	Meier S., Weber R., Zbinden R., et al.	2011	40	8
26	The dilemma of patient responsibility for lifestyle change: Perceptions among primary care physicians and nurses	Jallinoja P., Absetz P., Kuronen R., et al.	2007	40	4,44
27	Elevated Preoperative Hemoglobin A1c Level is Associated With Reduced Long-Term Survival After Coronary Artery Bypass Surgery	Halkos M.E., Lattouf O.M., Puskas J.D., et al.	2008	38	4,75
28	Primary prevention of latex related sensitisation and occupational asthma: a systematic review	LaMontagne A.D., Radi S., Elder D.S., et al.	2006	38	3,8
29	Community-Associated Extended-Spectrum beta-Lactamase-Producing Escherichia coli Infection in the United States	Doi Y., Park Y.S., Rivera J.I., et al.	2013	37	12,33
30	Trends in healthcare incident reporting and relationship to safety and quality data in acute hospitals: results from the National Reporting and Learning System	Hutchinson A., Young T.A., Cooper K.L., et al.	2009	37	5,29

Source: http://thomsonreuters.com/thomson-reuters-web-of-science/

Concluding Remarks

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Acknowledgment

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