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Information, Communication and Knowledge for Lean Healthcare Management Guidelines, A Literature Revision

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Abstract. The objective is to identify the management of information, communication and knowledge in Emergency Care Units (ECU). The method was a lexical and semantic analysis using VOSViewer, categorization of the results for a qualitative and cross analysis of the approaches on the subject. With the results of the practical application of the Lean Project in the ECU in 50 units it was possible to establish criteria and a parameter for knowledge management in this health area. The results categorize the publications in four central themes in healthcare: leadership and governance; quality in health; technology and information; Lean. The information flow is presented as a means, not an end activity and this is confirmed when the articles limit themselves to highlight the means of communication, applications or devices used for the dissemination of information, without further deepening of steps such as data collection, validation and valuation of information in health environments. The human factor is the main agent of change, because it needs clarity that the use of information and communication technologies do not make its final activity impossible, but it is a facilitating, agile and effective tool in the conduct of their work activities.

Keywords: Lean Healthcare · Information Management · Communication Management

1 Introduction

The healthcare environment is dynamic and its complexity of services, processes and application areas, both public and private is understood by society as chaos. The Unified Health System (SHS) is composed of several units, with different purposes each. They complement each other in order to meet the demands generated by the population's needs.

Because it operates on a large scale and in a country with territorial extensions such as Brazil, the operational noncompliance of SUS either due to decentralized management or inconsistency of data or lack of communication or incompatibility of software used in the units may influence the level of service. Information and communication are used in national statistics and provide some transparency and access to official information, generating an overview of public health in Brazil.

Thus, this research aims to identify the existence of practices focused on information and communication management in urgency and emergency hospital environments. This study seeks to answer the three following base questions: i) How is information and communication management applied in the health area? ii) How does knowledge management occur in the health environment?

2 Basis of concepts

Information needs a flow to drive improvements and for communication to be disseminated. The information flow requires constant evaluation, definition of collection instruments, transparency, discipline, continuous improvement to assist the decision making process and produce useful information [18]. The fragility of the information flow is presented: in redundancy, lack of clarity, reliability or diversity of sources; generate costs for the dissemination or creation in/of communication vehicles; fragmentation between sectors within the same organization; creation of communication barriers between the generating pole and the information consumer; rigidity to innovations; lack of objectivity; disorganization and inefficiency of systems and / or people.

A targeted and transparent workplace simplifies management when the work environment speaks to employees and managers. For Lean Healthcare to succeed, communication needs to be frequent in transmitting information, facilitating employee understanding and commitment [11] creates clear, measurable and bidirectional goals [16], and the results must be contemplated, demonstrated and transmitted to the right people [6].

The greatest practices in public sector are Information and Communication Technologies (ICTs) in government, the existing physical and network infrastructure and the provision of better services to citizens [9].

3 Method

The method was divided into two phases: 1. lexical and semantic analysis using VOSViewer with published articles on information and communication management in Lean Healthcare in Emerald Insights, Scopus/Elsevier, Medline/PubMed, Web of Science; 2. application of knowledge management in urgency and emergency of the Lean Project in Emergency Care Units (ECU).

4 Results

The authors citation network is formed by two clusters with two authors in each overlapping in pairs. The analysis of the impact factor of publications presents Tzortzopoulos, P.'s articles with the higher impact factor and the most cited work is from the year 2018 (Table 1). The highlight is for four authors with the highest number of publications being Improta, G. the most cited with five published works. The authors with the greatest number of works are little cited and were not listed. Therefore, the authorship and co-citation do not show an author as a reference in the subject studied.

Table 1. Relationship between author and quantity of quotations

Author	Documents	Year	Citations
Improta, G.	5	2020 (1)	0
		2019 (1)	2
		2018 (2)	9 and 19
		2017 (1)	18
		2020 (1)	0
Triassi, M.	4	2019 (1)	2
		2018 (2)	9 and 19
		2020 (2)	0 and 1
Tzortzopoulos, P.	4	2018 (2)	1 and 6
		2020 (2)	0 and 1
Junior, J. S.	4	2019 (1)	0
		2018 (1)	1

Triassi, M.'s publications have the second best impact factor and the most cited work is from 2018 in Mathematical Biosciences co-authored with Improta, G. and others. 65.8% are papers affiliated with Harvard Medical School (10) and the predominance is publication in English, in the form of scientific articles, and in countries such as the United States (77), including Brazil (12) and in three areas, Medicine (23.9%), Engineering (14%) and Computer Science (11%) and others.

In an analysis of the occurrence of words among the publications it was found that "Human" is the central key in a series of six clusters (Figure ??). Specificity addressing Information and Communication is on the fringe in the form of Internet of Things, big data, information management, machine learning and automation indicating the least amount of work or even indirect approaches in some publications, corroborating the justification and need for research on the topic.

Lean Production has a direct link with Sustainability and indirect Healthcare. However it is not related to information system or management. It is possible to highlight the research gap on communication, since it is treated as a direct consequence and restricted to means of transmission of information, without

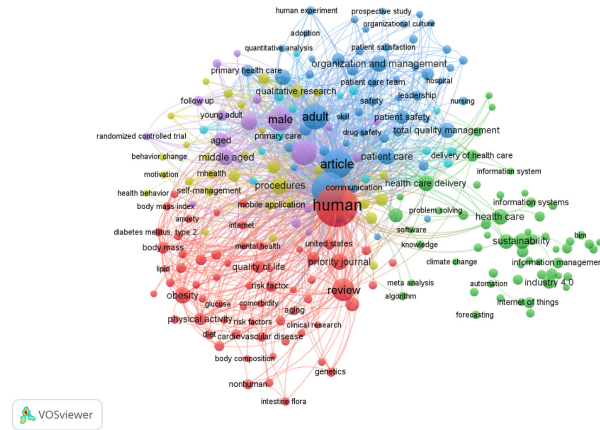


Fig. 1. The occurrence of words among publications

connection or specificities related to the subject. Only one article deals with terminologies and weaves discussions related to the research object of this study, however, this same article makes a superficial mention about Lean approaches.

The health environment is dynamic and there has been a concern to search for more recent works with open content, which has resulted in five works published in the last three years [2, 5, 14, 17, 20]. One article described applicability in Brazil [17], the others presented cases in the UK, Tanzania, Sweden and Canada. All articles presented key words that were linked to the health area, eight with managerial approaches [1, 2, 4, 5, 13, 17, 20, 22], five studies explicitly highlighted Lean or its minutiae/particularities [8, 12–14, 24] and five referred to information or communication or technology aspects [5, 17, 19, 20, 23], thus confirming the need to be read in their entirety.

In the phase of reading and analyzing the objectives of the selected articles, it was possible to categorize them into four central themes: leadership or governance; health quality; technology and information; Lean. In an analysis of the context of application and scope of the study, a prevalence was identified in the area of management, leadership [1, 4], and governance [17].

Communication is present in all Lean leadership principles and information gains accompany the leader's behavior and improve the value of information to the customer. The way of communicating happens verbal and non-verbal [1]. In a chaotic and urgent approach, Caro [4] and Aij and Teunissen [1] argue that strategic leadership improves the efficiency and effectiveness of emergency services when there is horizontal and vertical systemic integration, requires information exchange and a communication system.

In health sector organizations in Brazil identified formal and informal governance instruments and quality aspects. Quality in the healthcare sector requires collective projects to create coordination and collaboration actions. The findings

highlighted the lack of coordination and collaboration in the healthcare system as weaknesses that pose major risks to quality and safety in this environment [2].

Collaboration is the key to success and in dynamic and complex environments like hospitals highlights the need to know the essential elements of patients, to define people (technical staff), specialties, materials, technologies and information, working them in an aligned way [12, 14, 17].

Information and communication management is essential for understanding and referring actions. Communication is linked to how information is transmitted, uses technological resources to expedite when the patient's need is known [17] and any restrictions can affect the emergency service. Information technology links these services, ensures clear and effective communication between the parties [4] and should be applicable in all sectors and in a single area.

The health system uses communication technologies to transmit information and speed delivery to providers such as e-mail, telephone and messaging applications or online meetings. The combination of visual and textual information generates significant advances and efforts to create a comprehensive electronic record. An example of this is the operational efficiency of the organ center in Brazil.

The introduction of new technology makes information management more complex and requires systems that facilitate and promote information sharing in decentralized networks [10]. Information is linked to organizational image, requires standardization, unification of systems and simplified infrastructures [20] to reduce costs, increase reliability and implement operational efficiency.

With the use of Information and Communication Technology (ICT) and a shared platform there have been improvements in communication, creation of a revised and optimized workflow, information analysis, and real-time communication, qualitative feedback [19, 24] and management of their processes [21] especially in public sector management [7] in order to create value for government and society, making it smarter, more efficient, more effective, better communicated, more receptive and closer to citizens.

Finally the need to use Lean techniques and tools in healthcare highlights the importance of providing better quality and safety to patients [10, 13], managing costs, minimizing waiting times [1, 3, 12] and generating employee satisfaction [14]. Faced with increasing external pressure and challenges to overcome, hospitals and their branches of care that conduct their activities based on Lean knowledge have obtained good results in terms of humanizing patients and employees, eliminating barriers, centralizing efforts in service delivery and promoting integration between sectors even the sustainability of Lean [8, 15].

This study proposes a generalized flow Table 2 that aims at knowledge management, bringing people and processes together and defining a periodicity.

The purpose is to subsidize the activities of health professionals. However, it is necessary to distinguish two points on information and communication: i) their management for decision making and internal organization of working procedures in a health unit; ii) and, transparency, efficiency and use by clients/patients.

Thinking about a flow of Lean information and communication is to prioritize clarity, organization, trust, own identity and intelligibility.

Table 2. Proposed generalized information flow to the health environment.

Data	Information Management	Communication Management	Knowledge Management	ECU's Application
Source, types	Classification	Dissemination	Acquisition	Database creation in each unit
Collect, storage	Formating	Tecnologies	Storage	Data collection by sampling, recording of times per service and patient
Selection, sampling	Representation	Agility	Distribution	Enter the data in the form and/or system by patient
Filtration	Atualization	Reability	Use	Compile the cycle times per patient in spreadsheet
Accuracy	Applicability	Decision making	People: ability and competence	Check and understand the outliers in service cycle times per patient
Padronization	Padronization	Image	Process: resource and investiments	Visual management of average time (LOS -Length of stay), graph or Dashboard (Power BI)

The Lean project in ECU was developed in three phases: planning (Dec/2019 to Mar/2020); implementation (Mar/2020 to Oct/2020) with on-site technical visits to the units with weekly follow-up and reporting; and remote monitoring of the results achieved (Nov/2020 to May/2021). The results obtained with information, communication and knowledge management are: production and distribution of 10 technical scientific journals on Lean tools applied to public health registered with DOI; Development and online distribution of handouts to train the continuous improvement teams; 10 meetings of the Lean Project in the UPAs with a total of 3,530 participants from 8 states and the Federal District, and with themes related to the tools and methods of the Lean Project; Production and dissemination of 3 videos to integrate the teams; Presentation and communication of the project through social media (Facebook and Youtube, website and Whatsapp group); Monitoring of the technical visits in the UPAs and percentage control of the execution through Dashboard - Power BI with weekly feedback; Production of 450 technical visit reports; Achievement of 678 improvement actions evidenced and accessible through the application; Self-assessment of the Lean Healthcare maturity level of 3 Project ECU, after project implementation; Delivery of 926 certificates from PROEX-UFF for training and qualification of the Lean Project members in the UPAs; 6 books or book chapters; Development of 3 softwares (improvement practices, self-assessment and overcrowding).

The methodology benefited about 13 million users of the public network in the country, more than 28,300 hours of training for the 548 employees of the UPAs between the months of April and November 2020.

5 Conclusion

The use of information and communication technology is present in healthcare and this research confirmed that ICT is used to connect the system and help leaders in decision making, communication and management strategy. The least attention corresponds to functionality, technical specifications and cultural change issues as a means to be adopted in healthcare facilities.

Health units do not practice information management as a whole because there was no report on the origin and methods used to generate this information, allowing the conclusion that there is negligence on this issue. The human factor is resistant to the use of ICT in daily life, not the technology itself. The greatest benefit is in the activities of the professionals, but there is the neglect of information and communication for the patient, leaving them out of the whole process.

All information has its value, goes through a flow, is disseminated and reaches people. It should be the basis for decision making by managers. The usefulness and the audience to be served by this information varies. Knowledge must be transmitted in a clear, direct and accurate manner. The dynamics of the hospital environment offer opportunities for Lean Thinking to intervene in adjusting processes, streamlining patient care, organizing the work environment, and motivating employees. The result is an improvement in the quality of the service provided.

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