



Public policies on healthcare associated infections: A case study of three countries

Cassimiro Nogueira-Jr*, Maria Clara Padoveze

Department of Collective Health Nursing, School of Nursing, University of São Paulo, São Paulo, Brazil

ARTICLE INFO

Article history:

Received 17 February 2018

Received in revised form 10 June 2018

Accepted 6 July 2018

Keywords:

Health policy

Public health

Cross infection

Infection prevention and control

Program development

ABSTRACT

Healthcare-associated infections (HAIs) are a global concern due to the impact on healthcare safety. Consequently, they demand the implementation of effective public policies for their prevention and control. The objective of this study was to analyze and compare the implementation of national programs for the prevention and control of HAIs in Brazil, Chile, and Israel. The triangle of health policy analysis was used to compare the context, process, and content of national HAI prevention and control programs. Common elements identified among the three countries led to the proposal of an explanatory theoretical model constituted of two nuclei: formation, and development & sustainability. This model may favor to understand the factors that can influence the progress of a national HAI program, providing insights into the elements for establishing programs in countries where they are still inceptive.

© 2018 Elsevier B.V. All rights reserved.

1. Introduction

Healthcare-associated infections (HAIs) are a phenomenon of global concern, leading to high morbidity and mortality, and requiring the implementation of effective public policies to defeat them [1,2]. So far, few national programs for prevention and control of HAIs are fully successful. Many countries still present insufficient actions to achieve good results [3].

The implementation of a public policy is not a linear process, and it is linked to a variety of power relations and interests that pre-exist to its conception [4]. Public policies triggering and sustaining depend on the positive confluence of several factors, ranging from the pointing out of the problem to stakeholders up to the formation of a structure for its development [4]. In fact, the determinants of success in different scenarios are still unknown. Case analyses and interpretation schemes can contribute to understanding the phenomenon. A detailed analysis of a public policy can support the design of models to answer classically proposed questions about how and why certain government decisions are made [4].

The objective of this study was to compare the implementation of national HAI programs in three countries, characterizing their implementation and development to design an explanatory theoretical model that could guide the formation of national programs in other scenarios.

2. Methods

2.1. Study design

We performed a descriptive and exploratory case study that used the triangle of health policy analysis [5] to compare national programs for HAI prevention and control. This triangulation helps to systematically explore public policies through approaching to the relationships between their context, process, and contents, by assuming social actors as central elements [4].

The case analysis unit was the national HAI prevention and control program. The description of the evolutionary process of the programs followed the phases proposed by Padoveze et al. organizing the temporal occurrences according to the following phases: *Formation*: development of infection prevention techniques and practices; *Consolidation*: acknowledgement of HAI as a public health problem and development of the initial proposals of national program; *Standardization*: consolidation of program and establishment of nationwide regulations; *Monitoring and Evaluation*: full establishment of program at national level including mechanisms for measurement; recognition of HAI as a relevant patient safety issue, focus on continuous quality improvement, and cost savings [6].

2.2. Cases selection

The countries were selected based on a preliminary study about HAI surveillance systems through literature review, and consulting to electronic pages of several countries [7], taking into account

* Corresponding author at: School of Nursing, University of São Paulo, Av Dr Enéas de Carvalho Aguiar, 419, CEP 05.403-000, São Paulo-SP, Brazil.

E-mail addresses: cnogueirajr@yahoo.com.br (C. Nogueira-Jr), padoveze@usp.br (M.C. Padoveze).

that these systems reflect a certain maturity of HAI public policies. At this stage, 11 countries were pre-selected: Argentina, Australia, Brazil, Chile, Colombia, the United States, the Netherlands, England, Israel, and Uruguay. Additionally, in 2014 a “Cycle of Debates on Public Policies for the Prevention and Control of HAIs and Patient Safety” [8] was carried out, identifying relevant information for the definition of inclusion criteria in the study: existence of a national program prevention and control of HAIs; approval from the relevant authority for a visit to the program’s headquarters, and possibility of communication in Portuguese, English or Spanish. Based on these criteria, six countries were selected: Australia, Brazil, Chile, USA, United Kingdom and Israel. Two countries were excluded from planning visits for logistical reasons: insufficient time to obtain formal authorization and limited financial resources. USA was considered as a major national program with international repercussion and was excluded to avoid bias. Therefore, three countries were included: Brazil, Chile and Israel.

2.3. Data collection

Data were collected between 2014–2017 in three phases: **Phase I** - bibliographical and documentary research, by consulting the electronic pages of the programs of the selected countries; **Phase II** - visit to the headquarters of the national program to access supplementary information. In this phase, we used a structured roadmap to guide the data collection. We performed non-structured interviews with national team members and observations during meetings or other ordinary activities of the program. In addition, we carried out visits to healthcare facilities and meetings with other professionals in these settings. **Phase III** - development of the theoretical explanatory model.

2.4. Data analysis

Data were analyzed from the perspective of the triangle of analysis of public health policies [5] in combination with two other methods [9]: 1) *descriptive-comparative*: the context, process and contents of the programs were described and then paired; after this, 2) *descriptive-analytical*: data were categorized and discussed grounded by theories of public policies [4]. Briefly, by reading several times the results gathered through the roadmap, similarities and dissimilarities among three cases were extracted. Subsequently, the authors discussed and deeply analyzed these characteristics to identify elements which could be the base for developing the theoretical explanatory model.

2.5. Ethics

The present study was formally approved by the Ethics Research Committee (CRP) at the School of Nursing, University of São Paulo, under approval protocol number 1.400.148, on February 01, 2016.

3. Results

3.1. Case study 1 – Brazil

3.1.1. Context

Brazil is a Federative Republic with 26 states, one Federal District, and around 5570 municipalities, all with relative autonomy [10]. Several parties perform the political representation into the system. Its political-administrative organization is composed of the Union, States and Municipalities. Brazil has a continental territorial dimension, subdivided into five regions. It is the largest country in Latin America and the fifth largest in the world [10]. The Brazilian population is approximately 190 million inhabitants [11].

Its economy is among the ten largest in the world [12]. Brazil is a member of important political-economic organizations such as the United Nations (UN), Group of 20 (G-20), Southern Common Market (Mercosur) [13]. However, it is characterized by a wide regional and social inequality mainly due to poor income distribution and access to education and health. [11,14].

The current model of healthcare system was established by the 1988 Constitution, which defined the social welfare as a right for all and a duty of the State. During this period, the Unified Healthcare System (SUS) was settled, based on principles of universality, equity, integrality, decentralization, and community participation. The system splits into public and private subsectors, and the population is free to transit between them, predominantly according to their financial conditions [11]. Data of 2017 from the National Register of Health Establishments presented more than 6 thousand hospitals, with approximately 495 thousand beds. There is a high concentration of services in the southeast region [15].

The first documented committee for the prevention and control of HAIs in a Brazilian hospital was created in the 1960s [16]. In the late 1980s, many other committees were created, highlighting the professionals’ awareness of the problem. This movement guided the formation of a critical mass in the country, and a first governmental initiative with the promulgation of a law requiring these committees as being mandatory in Brazilian hospitals. During the same period, with the funding of the Pan American Health Organization (PAHO), a training program was developed aiming to disseminate knowledge about HAIs [16,17].

In 1985, the first democratically elected president after the end of the military dictatorship died, supposedly due to HAI. As a result, a countrywide process of sanitary audits in hospitals was evolved to scrutiny compliance with the legislation [7,16].

The national program was instituted in 1988, marking the inclusion of this health problem into the government’s agenda. The first actions of the program refer to training centers and educational activities supported by the Ministry of Health. The results were poorly documented [7,16].

3.1.2. Process

The *formation phase* of the program was characterized by decisions at the sphere of the Ministry of Health until the end of the 1990s, when the Brazilian Health Regulatory Agency (ANVISA) took over the responsibilities. There are no reports of widespread involvement of civil society in this development process (Fig. 1) [7,16,17].

The *consolidation phase* of the national program covered more than two decades, in which the actions were scarcely documented. Attempts to operate the program began to take shape with the management by ANVISA [7,16]. In 2011, a committee of experts including professionals outside ANVISA was established to support the national program (National Committee for HAI Prevention and Control). The national plan has been driven to strengthen the alignment between the federal level and the states [18].

The first project for an HAI surveillance system was instituted in 2005 but was unsuccessful. In the following decade, a new surveillance system was implemented with standardized criteria to define HAIs (*standardization phase*). Furthermore, a situational diagnosis supported the definition of goals and strategic actions. Initially, this system targeted on hospitals with ICU beds, in order to monitor the primary bloodstream infections. The first results were analyzed, supporting the reformulation of the program’s goals [7,16] (*monitoring and evaluation phase*). Currently, surveillance is targeted at all hospitals, and the scope of surveillance has also been extended to pneumonia associated with mechanical ventilation, urinary tract infections and surgical site infections (Chart 1) [19].

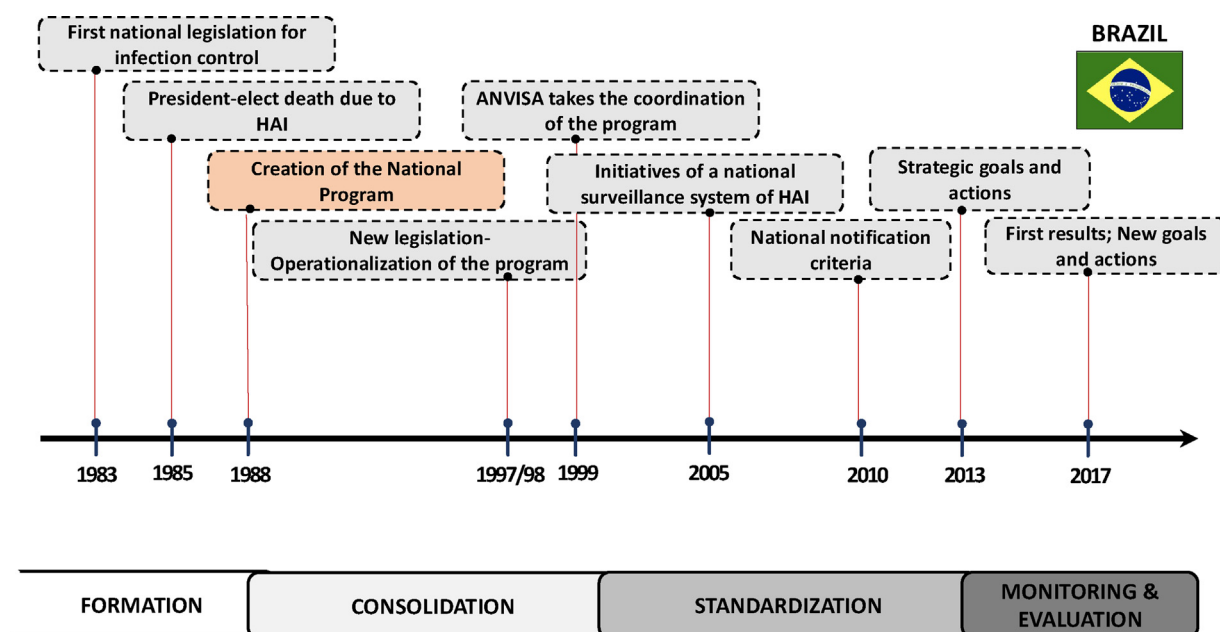


Fig. 1. Schematic representation of the Timeline of Brazil's National Program for Prevention and Control of Infection, according to the phases of formation, consolidation, standardization, monitoring, and evaluation*. São Paulo, 2018.

Note: ANVISA – Brazilian Health Regulatory Agency.

*Reference: Padoveze MC, Melo S, Bishop S, Poveda VB, Fortaleza C. Public policies on healthcare-associated infections: a Brazil and UK case study. *Rev Saude Publica*. 2017; 51:119.

Country	Program Elements				
	GOALS	FOCUS	TEAM	MAIN ACTIVITIES	RESULTS
BRAZIL¹	- Reduce the incidence of HAIs in health services; - Specific objectives of the period (2016-2020): consolidate the national HAI surveillance system, reduce the incidence of priority HAIs nationally, prevent and control the spread of microbial resistance at national level, and consolidate the national program.	Acute care hospitals	Seven professional experts, which include nurses, pharmacists and statisticians	- Publication of technical and regulatory guides; - Operationalization of the national HAI surveillance system - monitoring and continuous evaluation of outcomes; - Advisory to state committees for the implementation of HAI prevention and control actions; - Feedback to hospitals through reports with the results of epidemiological surveillance system data;	Between the years of 2011 and 2015: ↓ 22.9% of bloodstream infections (BSI) in adult ICU; ↓ 22.0% of bloodstream infections (BSI) in Pediatric ICU; ↓ of bloodstream infections (BSI) in all neonatal ICU birth weight categories).
CHILE²	- General objectives: Contribute to improve the quality of hospital care by reducing the occurrence of: HAIs, infections transmitted between patients and health professionals, and associated costs; - Specific objectives: reduce the incidence of HAIs associated with invasive procedures, outbreaks and occupational exposure; reduce transmission of occupational infection; increase efficiency and sensitivity of the surveillance and cost-benefit system of prevention and control activities; and reduce the costs associated with HAIs.	Health facilities that provide direct assistance with in-patients (hospitals and clinics), mostly acute care.	Two doctors and two nurse.	- Publication of technical and regulatory guides; - National surveillance system of HAIs – monitoring and systematic evaluation of results; - Sensitivity assessment of surveillance through prevalence studies; - Training and educational activities for health professionals; - Evaluation of practices through a regulated external evaluation system, at least every 3 years in public and private hospitals; - Providing feedback regarding of results of the national program to hospitals.	Between the years 2000 and 2009: ↓ 70.0% in infections post laparoscopic cholecystectomy; ↓ 65.0% in intestinal infections in infants; ↓ 58.4% in puerperal endometrites due to vaginal delivery; ↓ 32.4% in central catheter associated bloodstream infections in pediatrics
ISRAEL³	Control and prevent healthcare associated infections and contain microbial resistance in all Israeli health services.	Hospitals for acute care and long-term care facilities.	Physicians, infection control nurses, epidemiologists, a microbiologist and a data support team	- Publication of technical and regulatory guidelines; - Operation of National surveillance system of HAIs and microbial resistance – monitoring and systematic evaluation of results; - Training and educational activities for healthcare professionals; - Evaluation of infection prevention and control practices through periodic visits to selected hospitals yearly; - Providing feedback regarding of results of the national program to hospitals.	Between the years 2007 and 2012: ↓ 60% in the incidence of carbapenem-resistant Enterobacteriaceae. ↓ 91% Incidence of nosocomial CRE acquisition by clinical culture from 55.5 cases/100,000 pt-days to 4.8 cases/100,000 pt-days.

Chart 1. Summary Content of the National Programs of Infection Prevention and Control in Brazil, Chile and Israel, according to the elements: objectives, focus, team, activities and results. São Paulo, 2018.

Source:

¹Agência Nacional de Vigilância Sanitária - Boletim Informativo Segurança do Paciente e Qualidade em Serviços de Saúde – Dados 2015.

²Official document - MoH – Regulation nº124, October 2011 - Infection Prevention and Control Program. <http://web.minsal.cl/infecciones.intrahospitalarias/>.

³Schwaber MJ, Carmeli Y. An ongoing national intervention to contain the spread of carbapenem-resistant enterobacteriaceae. *Clin Infect Dis*. 2014;58(5):697-7.

Official document - MoH - Circular 09/2012 - Control and Prevention of Infections and Antimicrobial Resistance in Health Institutions.

Official document - MoH - Circular 16/2012 - National Program for the Rational Use of Antibiotics

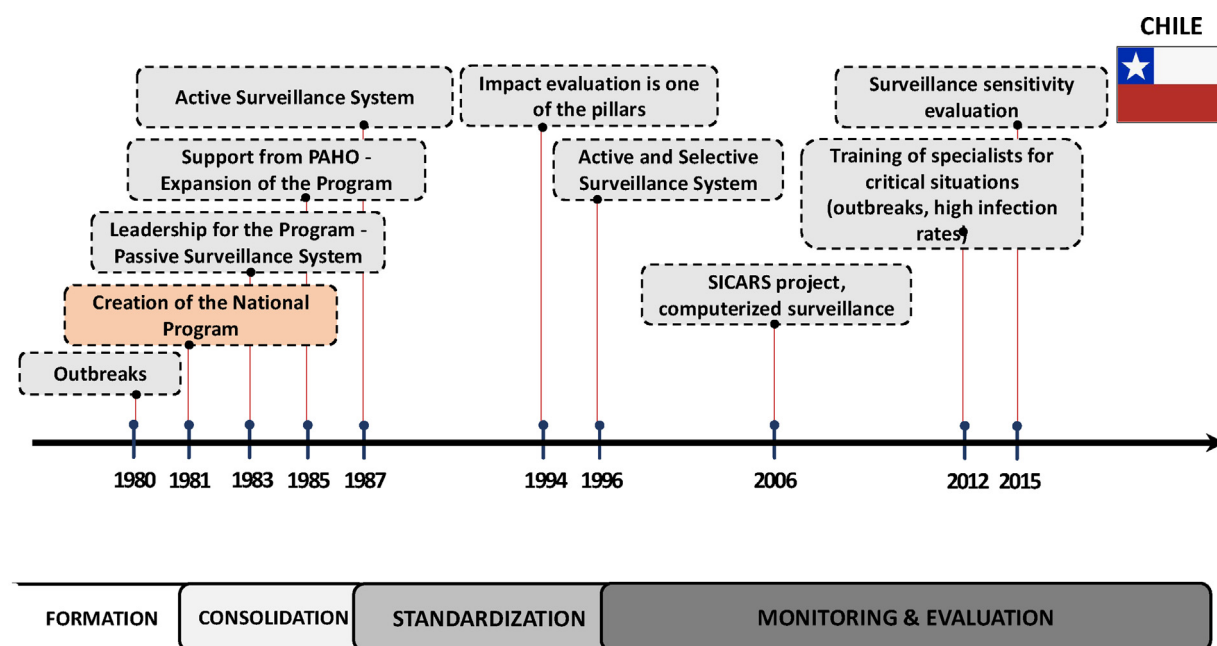


Fig. 2. Schematic representation of the Timeline of Chile's National Program for Prevention and Control of Infection, according to the formation, consolidation, standardization, monitoring and evaluation phases*. São Paulo, 2018.

Subtitle: PAHO - Pan American Health Organization / SICARS - System of quality indicators and healthcare outcomes.

*Reference:

Padoveze MC, Melo S, Bishop S, Poveda VB, Fortaleza C. Public policies on healthcare-associated infections: a Brazil and UK case study. *Rev Saude Publica*. 2017; 51:119.

3.2. Case study 2 – Chile

3.2.1. Context

Chile is a Democratic Republic, composed of 15 regions, 54 provinces and 346 municipalities. The President, democratically elected, is the head of the executive. The parliament consists of the Senate and the House of Representatives. The Chilean territory has a large territorial extension in the north-south direction and is narrow in the east-west direction. The country has a population of around 17.3 million inhabitants with ethnic composition basically formed by Amerindians and Spaniards [12,20].

It is one of the most stable and prosperous countries in South America, composing one of the five largest economies in Latin America. The Chilean economy is predominantly market-driven [12,20]. It integrates important commercial blocks such as: World Trade Organization (WTO), Economic Cooperation of Asia and the Pacific (APEC), Mercosur, among others [12,20].

The Chilean National Health Services System is mixed, both in terms of financing and provision. The public sector is responsible for the coverage of 80% of the population, and the other part is the private sector [21]. The Explicit Health Guarantees law aims to ensure access, opportunity and quality of health care. Four aspects characterize the evolution of the system: social demand, class bias, deficit and limited private business medicine [21]. The country has 404 hospitals and clinics of which 189 are public facilities, and 25,334 hospital beds in the public sector. The highest concentration of population and services are in the Metropolitan Region, Santiago [22].

The National Infection Control Program was created in the early 1980s. As a result of 3 different simultaneous outbreaks of HAIs in a short period of time with press coverage, the Ministry of Health structured a work team to act in the control of these infections and the first laws were promulgated starting the activities of the national program [23]. In the early years, the program received support from the Pan American Health Organization (PAHO); in the

following year it achieved important results, making it a reference for the control and prevention of HAIs at governmental level [24].

3.2.2. Process

The definition of composition of the program was initially established by the Ministry of Health. A medical leadership was designated to oversee the program, coordinating all activities (*formation phase*) (Fig. 2).

The program was consolidated in the 1980s, structuring a first surveillance system, by using a passive method. In 1987, with the outbreak of AIDS epidemic, there was increased concern about the prevention of occupational infections and iatrogenic transmission of HIV (*consolidation phase*) [23].

In the 1990s, the surveillance system was redesigned with the implementation of active and targeted and a set of diagnosis criteria for surveillance was established (*standardization phase*). Since then the national program produces evidence-based recommendations and regulations for HAI prevention that were applied in the public and private sectors. In the period between 2006 and 2007, this system became automated. In the 1990s, a systematic evaluation of hospitals through a tool which evaluated core components for HAI Programs by a trained group of experts under the mandate of the MoH became one of the pillars of the program, strengthening local supervision to achieve good results [23] (*monitoring and evaluation phase*). In 2012, 80% of Chilean hospitals achieved around 90% of conformity for the core components of the program. In 2012, the law that regulates patient's rights made it mandatory for every facility to have infection control according to the national principles and instructions.

The Chilean Society for Infection Control and Hospital Epidemiology, a group of professionals dedicated to the specialty created in 1997, played an important role in the consolidation phase of the program, contributing to the promotion and diffusion of good practices of prevention and control of infection.

The persistent monitoring of the program allowed recognition of some weaknesses and aspects that could be improved in the pro-

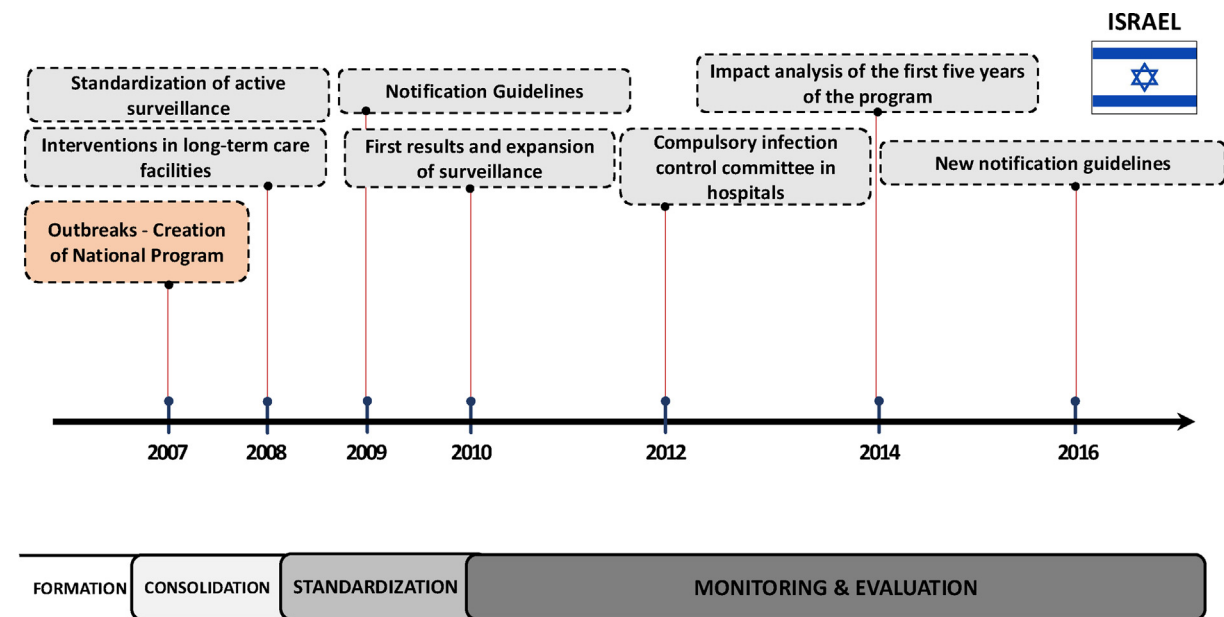


Fig. 3. Schematic representation of the Timeline of Israel's National Program for Prevention and Control of Infection and Antimicrobial Resistance, according to the formation, consolidation, standardization, monitoring and evaluation phases*. São Paulo, 2018.

*Reference:

Padoveze MC, Melo S, Bishop S, Poveda VB, Fortaleza C. Public policies on healthcare-associated infections: a Brazil and UK case study. *Rev Saude Publica*. 2017; 51:119.

cess, such as the detection of hospitals with prolonged outbreaks or with persistent high rates of infection without improvement. The surveillance system and the implementation of specific measures of infection prevention and control were anew reviewed. This step led to cycle of training of specialists and auditors; also a periodic study of sensitivity of the surveillance system was incorporated (Chart 1).

3.3. Case study 3 – Israel

3.3.1. Context

Israel is a republican parliamentary democracy supported by basic laws enacted by parliament, the Knesset. The territory of the country is long and narrow, with an area of 27,800 km [2]. The estimated population in 2015 was more than 8 million people [13,25,26].

It is one of the most advanced economies in Southwest Asia. High investments in education have transformed their economic profile into a modern market economy. The country is part of the economic blocks: World Trade Organization (WTO), Organisation for Economic Co-operation and Development (OECD) and others [13,25,26].

The Israeli healthcare system is universal, funded by income taxes from citizens. The healthcare provision is the responsibility of four nonprofit health plans and their health levels are compared with other developed countries [27,28]. The country has 30 public hospitals with approximately 15 thousand beds, and 296 long-term care facilities with 25 thousand beds, totaling approximately 40 thousand beds [29,30].

Since the 1980s, the country has already had the basis for HAI prevention and control by means of professionals working in this field, which formed associations, promoting events of scientific updating and periodic debates around this issue [30]. It should also be noted that some professionals had specific training in HAI prevention and control in institutions outside Israel.

The national Israeli program for infection control and antimicrobial resistance was established in 2007, as from a social demand for the control of outbreaks of *Klebsiella pneumoniae* resistant to car-

bapenems. The worrisome situation was highlighted and reported to the Director General of the Israeli Ministry of Health. This motion led to the formation of a national task force to contain the problem [30–32].

3.3.2. Process

After the formation of the task force, the first actions of the program included publication of technical guidelines on prevention and control of carbapenem-resistant enterobacteriaceae (CRE); establishment of a surveillance system; regulation on infection control committees in hospitals; and supervision of infection prevention practices by means of systematic visiting to health facilities (Fig. 3) [32] (formation phase quickly followed by the consolidation phase).

In 2008, the scope of surveillance extended to the long-term care facilities and the method of active surveillance was implemented. The following year, new regulations and guidelines for the treatment and reporting of infections caused by CRE and vancomycin-resistant enterococci (VRE) were released [30–32] (standardization phase).

Between the years 2010 and 2013, the first national results of the program were published [32], the establishment of infection control committees in hospitals have become mandatory, and further guidelines being published expanding the scope of surveillance for bloodstream infections and urinary tract infections. The program staff reviews their guidelines and publishes their results periodically [31] (monitoring and evaluation phase).

The Israeli program is currently structured under the Ministry of Health (MoH). The work team operating at national level has experience and training on HAI prevention and control. Relevant decisions are made at the ministry level, jointly with the national program team (Chart 1) [30].

3.4. Highlights of the content of national programs

In all cases, the content of the programs were modified along the years as the programs were developed. Although there are still

differences regarding the type of HAI being monitored, there are many similarities in actions and goals among the three programs.

The contents of programs focus the prevention and control of selected HAIs and microbial resistance (Chart 1). Mainly, blood stream infection, pneumonia associated to mechanical ventilator, urinary tract infection associated to urinary catheter, surgical site infection, and multidrug-resistant organisms (MDROs). To address the focus of the programs, all programs have in common the dissemination of specific technical guidelines and training programs, along as the evaluation and the dissemination of results. All programs have a surveillance system to monitor HAI.

There are no standard regarding the composition of human resources in national teams. There is variability in the number and category of professionals that compose them (Chart 1). Of note, in the three cases, professional turnover was mentioned as a barrier that hindered the progress of the national program, mainly in the Brazilian context. Once the team at national level has become more stable, there was a progress in the execution of action plans.

As the programs were consolidated, decreasing in the occurrence of HAIs was achieved in all scenarios.

3.5. Pairing of cases: elements of public policies for HAIs

The pairing procedure has an analytical purpose, aiming at the recognition of patterns of formation and development of programs. Of note, the events did not happen in a linear way in the countries. However, common elements in all of them have been identified.

The main problems that motivated the formation of national programs were HAI hyperendemics, outbreaks and the presence of related sentinel events (*necessity generators*). These have driven to alternatives aiming at solving them, which were designed by leaders with sufficient technical knowledge (*alternative generators*).

To make possible for the program to actually enter the governmental agenda, a favorable political environment was required. The emphasis given by the media, the encouragement of international organizations, and relevant scientific studies contributed to the formation of this environment (*promoter of social interest*).

The use of tools for situational diagnosis was present at different phases among the countries, and, when applied, it leveraged the program. The involvement of other government levels occurred unevenly due to the diversity among local conditions. However, without the participation of these interlocutors the local dissemination of the national strategy could be hampered (*decision generators*).

The surveillance systems constituted a support for the programs, allowing monitoring and evaluation of results. Whenever HAI surveillance became systematic it was possible to identify weaknesses and opportunities for improvement. In addition, the provision of ongoing training for professionals both in hospitals and other levels of government may have contributed to mitigate weaknesses and advancing the programs (*sustainability generators*).

The capacity for self-assessment of the programs was demonstrated through systematic analysis of epidemiological data, evaluation of the performance of the surveillance system and of the program, and by updating of legislation. These elements were inserted in the three countries as the programs have matured (*renewal generators*).

Some actors, social groups and organizations were common in the three scenarios: the Ministry of Health as the body responsible for conducting the first decisions and actions of the program, a qualified leadership with a coordinated team, and the professional associations of experts in HAIs. In Chile and Israel, all the coordination of the program has been under the aegis of the Ministry of Health since its inception to the present day, while in Brazil this responsibility has moved to another regulatory body - ANVISA. The scientific background of the program's team was a relevant factor

in the development of national programs. Mostly, this knowledge came from external experiences or support from foreign agencies. The deep engagement of the national team and the positive recognition of this team by other professionals in the field were substantial for legitimization of the proposed interventions. The permanence of the leadership long enough to consolidate this favorable perception helped the process to reach the goals from medium to long-term. Chile and Israel have maintained their leadership since the beginning of the program; in Brazil, this occurred only in the last decade, during which time the program leveraged. The formation of national committees with members representing civil society and government, plus coalitions between government levels, were elements to ground the program. These committees, with the participation of specialists, advise the program, support the proposals of interventions, while creating coalitions and channels of communication. This mechanism is a facilitator for dissemination of good practices from the national to local level, therefore broadening the extent of the national program. Regarding international organizations, in both Brazil and Chile, PAHO was an important actor by supporting scientific events and training programs (*process sponsors*).

These above described elements were grouped into main components of two structural nuclei of the national programs: the Nuclei of Creation and the Nuclei of Development & Sustainability (Chart 2, Fig. 4).

3.6. The theoretical-explanatory model

A deep analysis of relationship of these elements allowed to design a model of interpretation composed by two dimensions: one theoretical and one explanatory [33–35]. The main objective of the model is to bring insights about the phenomena under the study and to point out the relationship between the elements identified.

The theoretical dimension comprises two axes: the *definition of the problem*, represented by the need for a political decision to establish a national program; and the *minimum conditions* to solve it, represented by the core components of programs. Scientific evidence is the basis to justify the implementation of core components of a national program. This study does not intend to delve deeper into this dimension since there are already published guidelines from WHO with extensive work on this matter [3]. However, despite enormous contribution of these guidelines, there is no approach to the systemic conditions that may influence the development of programs at national level.

The explanatory dimension also comprises two axes: a strategic axis, represented by the nuclei; and a systemic axis, which encompasses the nuclei and affects the formation, development and sustainability of the program. For didactic reasons, we distinguish the nuclei of formation from the nuclei of development and sustainability. Nevertheless, in the real life they are amalgamated and the occurrences flow not perfect linear.

The strategic axis is represented by the pictorial elements within the dashed lines of the figure. This axis is convergent with theoretical dimension because all the national programs to prevent HAI should aim to achieve conformity to the core components proposed by WHO [3]. The systemic axis is represented by the elements surrounding the dashed line of the figure, which intend to demonstrate that national programs are embedded in a broad environment under forces such as the political-administrative organization, healthcare system financing and what is actually the understanding of concept of health in a given context.

The theoretical-explanatory model helps to understand the process underpinning the timeline phases of national program (formation, consolidation, standardization, monitoring & evaluation) [6] (Fig. 4). It brings understanding and to point out the correlation between the thematic categories identified in the case analysis,

NUCLEI	COMPONENT	ELEMENTS
Formation	Necessity generator	• Outbreaks • HAI Hyperendemicias • Sentinel Events (deaths by HAIs; death of celebrities)
	Alternatives generator	• Motivated leadership • Availability of specialized professionals • Access to specific training in HAI control and prevention • Associations of Infection Prevention and Control Professionals
	Promoter of Social Interest	• International Organizations • Professional Infection Control Associations • Media • State Bodies • Political Environment
Development & Sustainability	Decision Generator	• Availability of specialized professionals • Situational diagnosis of the context of the program implementation • Articulation between government levels • Involvement of other segments of the society (e.g. professional associations, members of civil society, among others)
	Sustainability Generator	• Motivated Leadership • Legitimacy of infection control and prevention professionals • Committees with representatives of civil society and government • Establishment of coalitions between governmental levels • Epidemiological Surveillance Systems • Resources for continuing vocational training • Dissemination of program results
	Renewal Generator	• Systematic review and reporting of results • Evaluation of the properties of the surveillance system • Evaluation of the performance of health services • Updating of specific legislation • Systematic evaluation of the national program
	Process Sponsors	• Leaders of the National Program • Specialized professionals in infection prevention and control • Professional Associations • International Organizations • State organs

Chart 2. Nuclei, components and elements of national programs for prevention and control of healthcare-associated infections (HAIs), proposed by the authors. São Paulo, 2018.

which may favor outlining alternatives to foster of these programs in other scenarios.

4. Discussion

The theoretical-explanatory model proposed in the present study is not intended to be definitive, but rather a contribution to the reflection on public policies in HAIs.

The context in which the herein studied national programs were formed suggests different reasons for the inclusion of HAI in the governmental agenda. Kingdon argued that public decisions are

subject to convergences of three factors: the problem, the solutions and the political context, producing a “policy window” that allows the structuring of these actions [36]. The inclusion of a problem into the governmental agenda and the planning of possible interventions must be endowed with legitimacy, viability and support [4].

In general, the media reinforce the problem, enlarging the visibility at the public sphere. Studies point out that the media may not be able to shape the way people think, but they play a fundamental role and have a great influence on the issues that attract these people's attention [37].

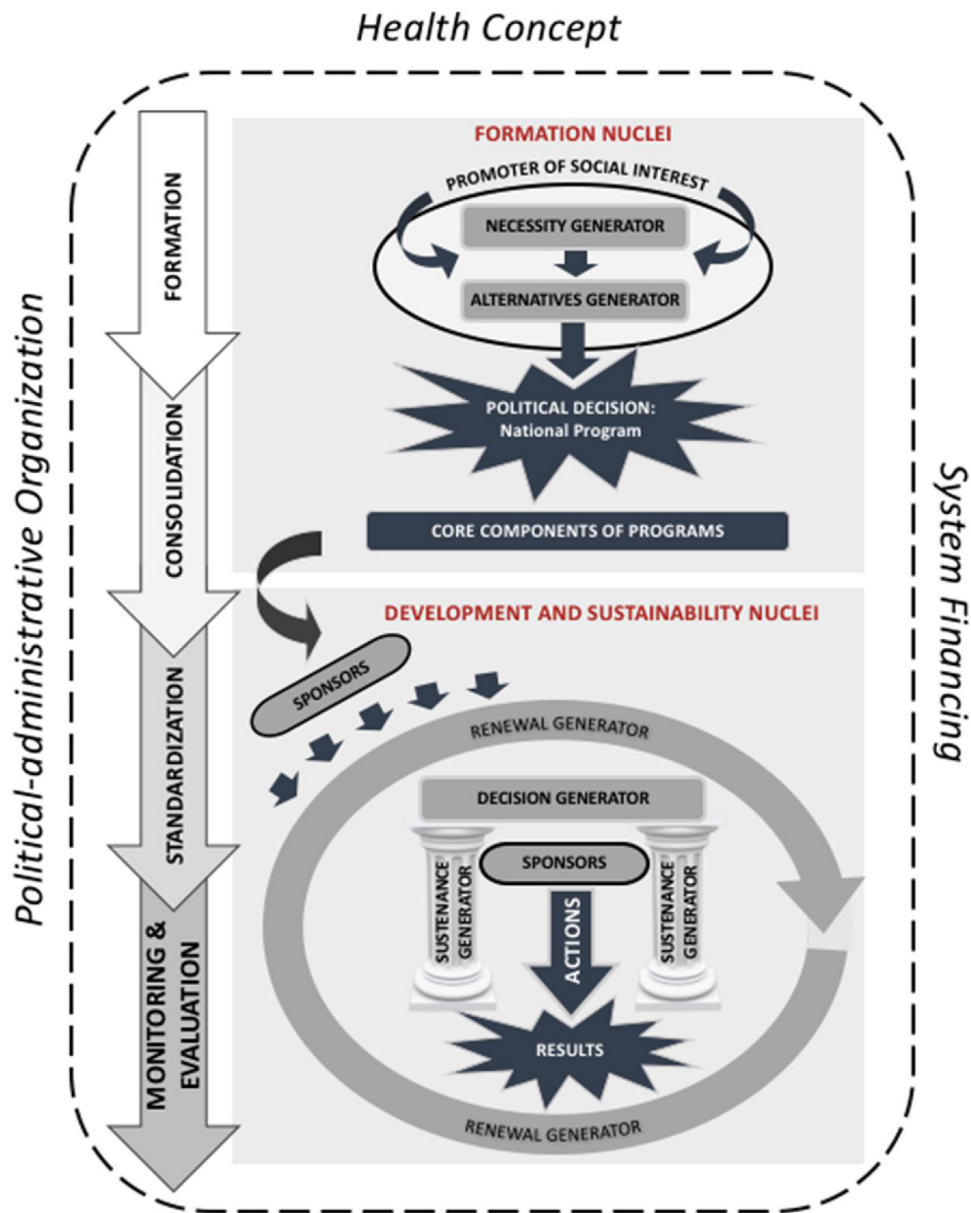


Fig. 4. Theoretical-explanatory model for the formation of national programs for prevention and control of healthcare-associated infections (HAIs). São Paulo, 2018.

The government is influenced by different actors, which vary in their power and capability to penetrate the political system and exert influence in the decision-making process in favor of their preferences and interests [4]. These actors foster the relevance of problem at the public scope, mobilizing the government for its management and allocation of resources to define problem-solution alternatives.

We observed that following the inclusion in the governmental agenda, the availability of detailed information about the magnitude and severity of the problem and the scientific technical knowledge were common points that influenced decision making. Of note, in the examples of the three case studies, this scientific knowledge came from professionals in strategic positions. Training programs and experiences exchanging with other professionals helped out the development of a critical thinking mass, favoring both the scrutiny of the problem and the proposition of alternatives [38]. There are several studies that demonstrate the need to intervene in the training of health professionals to achieve desired results [39].

As a transitional process, the implementation of public policies demands leadership with the knowledge and information necessary to conduct coordinated actions [4,40]. Leadership emerges from trained professionals, but it also requires special profile which includes motivation, perseverance, and consistency of goals. As the program's objectives could be achieved only at medium and long terms, skilled, engaged and motivated professionals are essential for the success of activities [2,41]. The examples analyzed suggest that the turnover of professional leaders should be avoided in order to prevent a breakdown in the strategy. There is still a lack of research on the ideal number of national team considering aspects such as geographic dimension, scaling of governmental levels, centralization and autonomy of these levels, and number of health services [42].

On the other hand, detailed information about the magnitude of the problem, although not determinant of a public policy, supports actions and guides their development [43]. In the context of public policies, the recognition of the causes of a problem is not a simple task, but necessary for formulation of alternatives. Gathering sci-

entific information and seeking the consensus of experts is vital to consolidate the policy-making process [39,44]. HAI surveillance is a key to guide interventions at both institutional and national levels. A consistent surveillance system in addition to proposal of feasible interventions sustains practices over time 41.

The implementation of the first initiatives at national programs happened in different ways in the countries studied. It assumed a bottom-up direction in Israel, coming from a group of experts to the Minister of Health, whereas in Brazil and Chile, from the government to the other technical levels, the process was rather a top-down sense [45].

The implementation of public policies is a dynamic process that can present different formats [40,45]. The actual development can be unpredictable due to its particularities: there are a multitude of potential actors involved with a variety of interests. In addition, these actors may change over time and modify the way of thinking, which can either advance or interrupt activities [4,45].

For favorable progress of public policies, the strategies adopted must be consistent and transparent [40]. In the three cases studied, we observed the use of coalition among actors, organization and public sector as an approach that allowed transparency, alignment, engagement and focus on common goals, broadening the strategic vision [40].

When it comes to generation of renewal in the process, the perspective of the evaluation should be both technical and political to perceive weaknesses, tendencies, and possibilities for expansion of strategy. As the cases studied suggest, generating renewal is a necessary condition for the sustainability of programs. Self-assessment is already recognized by WHO as an essential component of HAI control and prevention programs [3]. Evidence-based practices are essential to drive the program [2] and should be also used to refresh the ongoing process to adapt to the dynamic healthcare context.

It is vital to guarantee financial resources for the implementation and sustainability of a national program. In the cases studied, the programs advanced with the support of the highest health authority in the countries. The financial support occurs as long as the state perceives a problem as a priority for intervention [45].

The study has limitations. Although the selection of countries may not be representative of all potential scenarios, we believe that the proposed model is overall applicable, even to countries with different political and economic organization. The use of the triangle of analysis of public policies does not intend to deepen the investigation of historical roots that could have influenced the process. Finally, political decisions are naturally influenced by the scenario of each country. Understanding health as a right, benefit or product permeates decisions and interferes with the performance of health systems and consequently of their programs.

5. Conclusion

This study allowed to identify similar elements among cases studied, founding a possible theoretical-explanatory model for the formation, development and sustainability of a national program for HAI prevention and control. This model can be helpful to drive strategies in countries in which national programs are still incipient. Further investigation to validate the soundness of the model is still needed.

Financial disclosure

This study was supported by the Brazilian National Council for Scientific and Technological Development (CNPq), Brazil, under grant number 460783/2014-9.

Funding

This study was funded and subsidized by the The Brazilian National Council for Scientific and Technological Development (CNPq), under process number 460783/2014-9, with dispatch issued on 2014.

Conflict of interest

Authors declare that they have no conflict of interest related to the subject of the present study

Acknowledgements

We wish to thank all of the individuals who were essential for this study to be implemented: government managers of HAI control and prevention in the Brazil, Chile and Israel. We would like to acknowledge the support from Dr. Fernando Otaiza O'rain, Dr Mitchell J Schwaber and Magda Machado de Miranda Costa.

References

- [1] Stone PW, Braccia D, Larson E. Systematic review of economic analyses of health care-associated infections. *American Journal of Infection Control* 2005;33(9):501–9.
- [2] Cardo D, Denney PH, Halverson P, Fishman N, Kohn M, Murphy CL, et al. Moving toward elimination of healthcare-associated infections: a call to action. *Infection Control & Hospital Epidemiology* 2010;31(11):1101–5.
- [3] Allegranzi B, Nejad SB, Combescure C, Graafmans W, Attar H, Donaldson L, et al. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *The Lancet* 2011;377(9761):228–41.
- [4] Buse K, Mays N, Walt G. *Making health policy*. UK: McGraw-Hill Education; 2012.
- [5] Walt G, Gilson L. Reforming the health sector in developing countries: the central role of policy analysis. *Health Policy and Planning* 1994;9(4):353–70.
- [6] Padoveze M, Melo S, Bishop S, Poveda V, Fortaleza C. Public policies on health-care associated infections: a case study of Brazil and UK. *Revista de Saúde Pública* 2017;51(119).
- [7] Nogueira Jr C, de Mello DS, Padoveze MC, Boszczowski I, Levin AS, Lacerda RA. Characterization of epidemiological surveillance systems for healthcare-associated infections (HAI) in the world and challenges for Brazil. *Cad Saude Publica* 2014;30(1):11–20.
- [8] Levin AS, Padoveze MC. Ciclo de Debates em Políticas Públicas para a Prevenção e Controle de IRAS e Segurança do Paciente: Relatório Final; 2015 [Available from: <http://www.ee.usp.br/eventos/2014/ciclo.debate/seguranca.paciente.iras.relat.fina.pdf>].
- [9] Lakatos EM, Marconi Md A. *Fundamentos da metodologia científica*. Fundamentos da metodologia científica: Altas; 2010.
- [10] IBGE Instituto Brasileiro de Geografia e Estatística, 2016. [Available from: www.ibge.gov.br] 2016.
- [11] Paim J, Travassos C, Almeida C, Bahia L, Macinko J. *The Brazilian health system: history, advances, and challenges*; 2011.
- [12] FMI Fundo Monetário Internacional 2017 [Available from: <http://www.imf.org/external/index.htm>].
- [13] CIA. Central Intelligence Agency 2017 [Available from: <https://www.cia.gov/index.html>].
- [14] IBGE. Pesquisa nacional por amostra de domicílios contínua, 2011; 2011 [Available from: www2.ibge.gov.br/home/estatisticas/pesquisas/pesquisa.resultados.php?id_pesquisa=40].
- [15] Brasil [Available from: cnes.datasus.gov.br/Mod_Ind_Unidade.asp].
- [16] Padoveze MC, Fortaleza CMCB. Healthcare-associated infections: challenges to public health in Brazil. *Revista de saude publica* 2014;48(6):995–1001.
- [17] Lacerda RA, Jouclas VMG, Egrý EY. Infecções hospitalares no Brasil. Ações governamentais para o seu controle enquanto expressão de políticas sociais na área de saúde. *Revista da Escola de Enfermagem da USP* 1996;30(1):93–115.
- [18] ANVISA. Agência Nacional de Vigilância Sanitária. 2016. Available from: <http://portal.anvisa.gov.br/>.
- [19] ANVISA. Available from: Programa Nacional de Prevenção e Controle de Infecções Relacionadas à Assistência à Saúde (2016–2020). Brasília: ANVISA; 2016 <https://www20.anvisa.gov.br/segurancadopaciente/>.
- [20] Chile Gobierno do Chile 2017 Available from: <http://www.gob.cl/>.
- [21] Labra ME. Política e saúde no Chile e no Brasil. Contribuições para uma comparação. *Ciência & Saúde Coletiva* 2001;6(2).
- [22] Chile, Available from: Departamento de Estadísticas e Información de Salud; 2015 <http://www.deis.cl/>.
- [23] Chile. Sistema de Vigilancia de las Infecciones Intrahospitalarias. Ministerio de la Salud; 1998.

- [24] WHO, Available from: How clean hands have helped save lives in Chile; 2017 <http://www.who.int/features/2017/clean-hands-chile/en/>.
- [25] The World Bank, Available from: The World Bank group; 2017 <http://www.worldbank.org/en/who-we-are>.
- [26] Israel, Available from: The electoral system in Israel; 2017 <http://www.knesset.gov.il/description/eng/eng.mimshal.beh.htm>.
- [27] Rosen B, Waitzberg R, Merkur S. Israel: health system review. WHO Regional Office for Europe; 2015. Contract No.: 6.
- [28] Balicer R, Shadmi E, Manor O, Leventer-Roberts M. Israel: structural and functional integration at the Israeli healthcare system | SpringerLink. In: *Handbook integrated care*. SpringerLink; 2017. p. 585–95.
- [29] Health Services - Central Bureau of Statistics [Internet]. 2017. Available from: http://www.cbs.gov.il/reader/?Mlval=cw_usr_view_SHTML&ID=189.
- [30] Schwaber MJ, Carmeli Y. The impact of a carbapenem-resistant enterobacteriaceae outbreak on facilitating development of a national infrastructure for infection control in Israel. *Clinical Infectious Diseases* 2017.
- [31] Schwaber MJ, Carmeli Y. An ongoing national intervention to contain the spread of carbapenem-resistant enterobacteriaceae. *Clinical Infectious Diseases* 2014;58(5):697–703.
- [32] Schwaber MJ, Lev B, Israeli A, Solter E, Smollan G, Rubinovitch B, et al. Containment of a Country-wide outbreak of carbapenem-resistant klebsiella pneumoniae in Israeli hospitals via a nationally implemented intervention. *Clinical Infectious Diseases* 2011;52(7):848–55.
- [33] Weiss CH. How can theory-based evaluation make greater headway? *Evaluation review* 1997;21(4):501–24.
- [34] Trostle J, Bronfman M, Langer A. How do researchers influence decision-makers? Case studies of Mexican policies. *Health Policy and Planning* 1999;14(2):103–14.
- [35] Arredondo A, Meléndez V. Modelos explicativos sobre la utilización de servicios de salud: revisión y análisis. *Salud pública de México* 1992;34(1):36–49.
- [36] Kingdon J, Thurber J. *Agendas, alternatives, and public policies*. 45. Boston: Little, Brown; 1984. p. 165–9.
- [37] McCombs ME, Shaw DL. The agenda-setting function of mass media. *Public Opinion Quarterly* 2017;36(2):176–87.
- [38] Costa CGF, Silva EV. O que Realmente Importa no Processo de Tomada de Decisão Considerando Políticas Públicas Baseadas em Evidência. *Revista Administração em Diálogo* 2016;18(2):124–43.
- [39] Storr J, Twyman A, Zingg W, Damani N, Kilpatrick C, Reilly J, et al. Core components for effective infection prevention and control programmes: new WHO evidence-based recommendations. *Antimicrobial Resistance & Infection Control* 2017;6(1):6.
- [40] Lima LL, D'Ascenzi L. Public policy implementation: analytical perspectives. *Revista de Sociologia e Política* 2013;21(48):101–10.
- [41] Louis MS. Global health surveillance. *MMWR Surveillance Summaries* 2012;61(Suppl):15–9.
- [42] Nogueira Jr C, Padoveze MC, Lacerda RA. Sistemas governamentais de vigilância de infecções relacionadas à Assistência à Saúde no Brasil. *Revista da Escola de Enfermagem da USP* 2014;48(4):656–61.
- [43] Capella ACN, Unesp Araraquara B, Unesp Araraquara B, Brasil FG, UFSCar B, UFS-Car B, et al. Análise de políticas públicas: uma revisão da literatura sobre o papel dos subsistemas, comunidades e redes. *Novos estud – CEBRAP* 2015;101:57–76.
- [44] Stetler CB, Brunell M, Giuliano KK, Morsi D, Prince L, Newell-Stokes V. Evidence-based practice and the role of nursing leadership. *Journal of Nursing Administration* 1998;28(7/8):45–53.
- [45] Secchi L. *Políticas públicas: conceitos, esquemas de análise, casos práticos*. São Paulo: Cengage Learning; 2010. p. 133.