TEXTO & CONTEXTO ENFERMAGEM

TEXT & CONTEXT NURSING TEXTO & CONTEXTO ENFERMERÍA

IMPLEMENTATION OF AN ELECTRONIC MEDICAL RECORD IN LIGHT OF THE ACTOR-NETWORK THEORY

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ABSTRACT

Objective: to describe the human and non-human actors network involved in the implementation of an electronic medical record in Primary Health Care in Minas Gerais.

Method: this is a study with a qualitative approach, with the Actor-Network Theory as a theoretical framework and Controversy Cartography as a methodological framework. We interviewed 20 health professionals, managers and other spokespersons involved with the implementation of an electronic medical record in a city in Minas Gerais State. We conducted observation and collection of 30 documents when following the participants from September 2018 to August 2019. For analysis, we used the following scales to visualize the mapped social dynamics: Minor Scale (brief and chronological description of the main events); Intermediate Scale (identification of humans and non-humans, their relationships and controversies); Major Scale (detailed description of the main controversies).

Results: the network of actants involved in the electronic medical record implementation is woven from controversies: multiple actants and their translations influencing the electronic medical record implementation; contributions and weaknesses shaping the electronic medical record as an open controversy. Such controversies emerged from the mobilization of actors from various spheres of government, in addition to the place of implementation. Despite the weaknesses found, the electronic medical record contributed to: support decision-making; monitor patients' health history; integrate information between the assistance network points.

Conclusion: the success of the technology implementation was influenced by the relationships established between humans and non-humans from different management spheres, which, by mobilizing, strengthen or weaken computerization.

DESCRIPTORS: Electronic health records. Medical informatics. Nursing informatics. Information technology. Primary health care.

IMPLANTAÇÃO DE UM PRONTUÁRIO ELETRÔNICO A LUZ DA TEORIA ATOR-REDE

RESUMO

Objetivo: descrever a rede de atores humanos e não humanos envolvidos na implantação de um prontuário eletrônico na Atenção Básica à Saúde de Minas Gerais.
Método: estudo de abordagem qualitativa, tendo a Teoria Ator-Rede como referencial teórico e a Cartografia de Controvérsias como referencial metodológico. Entrevistamos 20 profissionais de saúde, gestores e outros porta-vozes envolvidos com a implantação de um prontuário eletrônico em um município de Minas Gerais. Realizamos observação e coleta de 30 documentos ao seguir os participantes no período de setembro de 2018 a agosto de 2019. Para análise, utilizamos as seguintes escalas de visualização das dinâmicas sociais cartografadas: Escala Menor (descrição sucinta e cronológica dos principais acontecimentos); Escala Intermediária (identificação dos humanos e não humanos, suas relações e controvérsias); Escala Maior (descrição detalhada das principais controvérsias).
Resultados: a rede de *actantes* envolvidos na implantação do prontuário eletrônico é tecida a partir das controvérsias: múltiplos *actantes* e suas traduções influenciando a implantação do prontuário eletrônico; contribuições e fragilidades conformando o prontuário eletrônico como uma controvérsia em aberto. Tais controvérsias emergiram a partir da mobilização de actantes de várias esferas de governo, além do local de implantação. Apesar das fragilidades constatadas, o prontuário eletrônico contribuiu para: apoio à tomada de decisões; acompanhamento do histórico de saúde do paciente; integração das informações entre os pontos da rede assistencial.
Conclusão: o sucesso da implantação da tecnologia foi influenciado pelas relações estabelecidas entre humanos e não humanos de diversas esferas de gestão, que, ao se mobilizarem, fortalecem ou fragilizam a informatização.

DESCRITORES: Registros eletrônicos de saúde. Informática médica. Informática em enfermagem. Tecnologia da informação. Atenção primária à saúde.

IMPLANTACIÓN DE UNA HISTORIA CLÍNICA ELECTRÓNICA A LA LUZ DE LA TEORÍA ACTOR-RED

RESUMEN

Objetivo: describir la red de actores humanos y no humanos involucrados en la implementación de una historia clínica electrónica en Atención Primaria de Salud en Minas Gerais.
Método: estudio de abordaje cualitativo, utilizando la Teoría Actor-Red como marco teórico y la Cartografía de Controversia como marco metodológico. Entrevistamos a 20 profesionales de la salud, gerentes y otros voceros involucrados en la implementación de una historia clínica electrónica en una ciudad de Minas Gerais. Realizamos observación y recolección de 30 documentos al seguir a los participantes desde septiembre de 2018 hasta agosto de 2019. Para el análisis, usamos las siguientes escalas para visualizar la dinámica social mapeada: Escala menor (descripción breve y cronológica de los principales eventos); Escala intermedia (identificación de humanos y no humanos, sus relaciones y controversias); Escala mayor (descripción detallada de las principales controversias).
Resultados: la red de actores involucrados en la implantación de la historia clínica electrónica se teje a partir de las controversias: múltiples actores y sus traducciones influyen en la implantación de la historia clínica electrónica; contribuciones y debilidades que configuran la historia clínica electrónica como una controversia abierta. Tales controversias surgieron de la movilización de actores de diversas esferas de gobierno, además del lugar de implantación. A pesar de las debilidades encontradas, la historia clínica electrónica contribuyó a: apoyar la toma de decisiones; monitorear el historial de salud del paciente; integrar información entre los puntos de la red de asistencia.
Conclusión: la implementación exitosa de la tecnología estuvo influenciada por las relaciones que se establecen entre humanos y no humanos desde diferentes esferas de gestión, que, al movilizar, fortalecen o debilitan la informatización.

DESCRIPTORES: Registros electrónicos de salud. Informática médica. Informática de enfermería. Tecnología de la informacion. Atención primaria de salud.

INTRODUCTION

In Brazil, the computerization of Primary Health Care (PHC) is sought based on e-SUS Primary Care Strategy (e-SUS AB - *Estratégia e-SUS Atenção Básica*).[1] This is a set of actions that allow improving care management and coordination based on the incorporation of information technologies.[1] It consists of two software systems: Simplified Data Log (*Cadastro de Dados Simplificado -CDS*) and Citizens' Electronic Medical Records (*Prontuário Eletrônico do Cidadão - PEC*. The software seeks, among other things, to restructure and integrate information from different points of the assistance network from mobile devices, broadband internet, computer installation and other technologies.[1]

PEC was developed to organize professionals' service agenda, systematize patients' clinical history and generate reports aimed at local planning.[2] The Brazilian Ministry of Health (MoH) also allowed its own electronic medical records (those developed by Municipal Health Departments or acquired through the private sector) to be implemented. The condition is that such records disseminate information to the Health Information System for Primary Care (*Sistema de Informação em Saúde para a Atenção Básica* -SISAB) of e-SUS AB strategy.[2] The electronic medical record (ER) (object of this research) was developed by the Municipal Health Department (*Secretaria Municipal de Saúde* - SEMUSA), disseminating information on SISAB.

Some studies show that electronic medical records speed up access to patient data, providing continuity of care. They also make information more readable and qualified, tending to eliminate redundancies and data loss. The recorded data can support the understanding of clinical condition and decision-making, promoting qualified care management.[3–7] There are also studies, related to electronic medical records, that demonstrate many cases of failure due to some weaknesses such as connectivity deficiencies, little skill and resistance of professionals, work overload, and low training of professionals.[8–9]

Studies are still needed to clarify the process of implementing electronic medical records, especially in PHC, where information management needs to be organized and systematized in order to qualify care management.[10] It is noteworthy that the implementation of electronic medical records is taking place across the national territory, requiring assessments of this process and, mainly, how this technology has influenced the management of care in the daily lives of professionals and patients.

It is necessary to investigate the implementation of ER from a sociotechnical approach, which does not dissociate the "technical" (hardware/software and other components) from the "social" (people, politics, subjectivities and the organization itself), but recognizes the technology as a non-human immersed in a network of relationships considering dynamics and processes.[11–14] Technological artifacts are not reduced to technical devices (work instruments), without the possibility of emitting effects on people.[15] Humans and non-humans have the capacity for agency (they have effects on each other) in a network, weaving relationships.

Thus, it is necessary to consider the constitution of networks of human and non-human actors in relation to the implementation of a technology, such as ER. It is necessary to follow the network weaving, describe it and understand this process as a social phenomenon to be understood. This time, we defined as the guiding question: how is the human and non-human actors network involved in the implementation of an ER in the PHC woven? We sought to describe the human and non-human actors network involved in the implementation of an ER for PHC in Minas Gerais State.

METHOD

This is a study with a qualitative approach, based on the Actor-Network Theory (ANT) and Controversy Cartography as theoretical-methodological frameworks. When following the human and non-human actors network, the researcher takes over connections and negotiations related to

controversies that are forming.[15] We used the four movements of the cartographic researcher: seeking a gateway to the network and start following the actors; identifying spokespersons (human actors) who agree or disagree who speak over the network; accessing the registration devices (documents and other devices) that allow the exposure of the network; mapping the associations between actants (describe conflicts, agreements, synergism, and divergences).[16]

In the first movement, the gateway was the Municipal Department of Health (MDH) of a municipality in western Minas Gerais. Such choice was justified due to the fact that the municipality is going through the process of implementing ER in PHC. ER, object of this study, was developed by the municipality's information technology team from January to August 2018, with implementation beginning in September of the same year. It was developed with the purpose of allowing health professionals to carry out all care records (appointments, appointments, consultations, evolutions) and prescriptions.

In the second movement, the first spokespersons identified were two MDH employees, responsible for the process of implementing the ER. The researcher started to follow them and map their relations with other actors, including those who manifested themselves as dissenting voices. When going through the network, the researcher was sent to 10 health units (2 Basic Health Units (BHU) and 8 Family Health Strategies (FHS)), totaling 31 human actors in a row from September 2018 to August 2019. Such actors were followed for conforming themselves as mediators, i.e., those who exercise influence on the network, modify it and, therefore, when followed, reveal the established relationships, alignments, and conflicts.[15]

When following the actors, we used participant observation, as it provides the cartographic researcher with greater evidence of the tracks left, thus culminating in a more appropriate description.[15] The researcher actively participated in the processes and discussions related to the implementation of technology in the researched settings. The researcher in ANT is considered a mediating actor in the network, i.e., he actively participates in interactions between connection points and collaborates in the construction of the phenomenon.[15–16] Guided by a script, the researcher observed the daily work of human actors and their relations with non-humans, the context, conditions and means used to implement the ER. Observations were made at MDH and BHU during meetings, trainings and clinical consultations using ER. The information was recorded in a field diary and coded as Observation Notes (ON).

Thus, 31 spokespersons were followed (11 nurses, 04 resident nurses, 09 physicians, 02 psychologists, 02 managers, 02 computer technicians, 01 responsible for the Regional Health Superintendence (RHS)). However, 20 were interviewed (7 nurses, 3 resident nurses, 5 physicians, 2 managers, 2 computer technicians and 1 responsible for RHS)) from an open interview script. We justify the interviews of the 20 spokespersons due to the need for the researcher to understand some questions that emerged in the field, in addition to being available to answer such questions. In the researcher's assessment, they conformed themselves as key informants for understanding the network. Even following a larger number of spokespersons, ANT[15] proposes to interview only those who can clarify questions and deepen them to the point of saturating the necessary information, i.e., reaching a state where the information becomes repetitive, not being other interviewees are needed, conceiving a less distorted and closer understanding of the network.

In ANT, the interview is a relevant source of evidence, as it provides the researcher with a way to make sure that their perceptions are in accordance with that of the actors. The interview script should be minimalist (initial questions), as many questions emerge during the act of following.[15] We define as initial questions: how do you perceive the electronic medical record implementation? What does the electronic medical record being implemented mean to you? The interviews took place in a

place defined by participants, lasting approximately 50 minutes; the audio was recorded and later transcribed to a database.

To preserve participants' confidentialit, we have defined a coding system: responsible for conducting the ER implementation (RESP1, RESP2); nurse (NUR1, NUR2...); physician (PHY1, PHY2...); resident nurse (RNUR1, RNUR2...); manager (MAN1, MAN2); responsible for the Regional Health Superintendence (RESP RHS); computer technician (TE1, TE2).

In the third movement, the researcher came across 30 registration devices (RD) (published regulations, manuals, email, WhatsApp, reports), which emerged in the research field, being listed as being directly related to the implementation of the studied ER. RDs materialize information about the network, clarify facts and make it possible to "objectify" the network, clarifying the social dynamics under construction.[15–16]

In the fourth movement, it is necessary to describe the movements instead of trying to explain the situations, map and outline the networked articulations and, *a posteriori*, find a certain sense of order in the collected data.[15–16] In order to systematize the description, based on narrative of facts and events, we followed the propositions of ANT,[15] where the researcher must observe the elements that interact with each other and describe: (1) how they are made attribution of causes and effects; (2) which actors are interconnected; (3) what dimensions do these associations have; (4) who are mediating spokespersons; and (5) how all of these elements are modified during the controversy. For data analysis, we used the scales of visualization of the mapped social dynamics (Minor Scale, Intermediate Scale, Major Scale).[17] In the Minor Scale (greater amplitude and less detail), we made a brief description of the main events, delimiting the time frames related to the ER implementation. In the Intermediate Scale (range and intermediate details), we sought to identify humans and non-humans, their relationships and controversies, without going into the details of the debates that have occurred. In the Major Scale (lesser breadth and greater detail), we carried out a detailed description of the main controversies, following the procedures: highlighting the actors involved in the debates, their arguments, defenses, and decisions; paying attention to actants who occupy positions of greater influence and minorities; highlighting observed scenes; making analytical comments in the light of ART concepts. In this article, we chose to highlight two controversies: multiple actants and their translations influencing the ER implementation; contributions and weaknesses shaping ER as a controversy in effervescence.

RESULTS

Multiple actants and their translations influencing the implementation of electronic medical records

We started the journey by following two MDH actors: a professional responsible for coordinating and monitoring the ER implementation in the municipality (RESP1) and an Information Technology professional responsible for the same process (RESP2). When following them, we participated in the first meeting guided by a discussion about the ER implementation. In this meeting, we realized the first controversy: deciding to implement the PEC made available by the MoH, implementing its own Electronic Health Record (own ER), already made available through its own Information System (IS), developed by the municipality, or acquiring another ER used in some municipality. The passage clarifies the controversy: [...] *the Department technicians made visits to other municipalities to learn about other realities and, from there, decide whether to implant a new one, to use the electronic medical record already inserted in the municipal system itself, or the electronic health record of the Ministry of Health would be implemented* [...] (RESP2).

In this controversy, RESP1 was instrumental in the decision to adopt the ER itself, already existing in the municipal SIS itself. The advantages of ER impregnated his speech: [...] *our System does not only attend to Primary Care, but to other sectors. As for the Ministry, it is only for Primary Care. We would lose this link with specialized services, pharmacies and the ECU* [...] (RESP1). At the end of the meeting, it was decided to implement the existing ER in the municipal Information Health System itself. In MDH, a discussion started on the different ways of presenting the ER to health professionals. It was decided the need to test it before its implementation so that possible difficulties detected by professionals could be raised. Therefore, pre-tests were carried out for one week with five professionals (physicians and nurses). In the various attempts, no difficulties or obstacles were found for the use of ER (ON).

Other actors in the network were also invited to undergo the same tests. Despite the confirmation that it was an easy-to-use technology, the actors decided to elaborate a Standard Operating Procedure (SOP), a non-human one, which already emerged as a technical support in the possible doubts during the use of ER (ON). After SOP was prepared, another meeting was held involving RESP2, MAN1 and MAN2 for discussions related to the "most appropriate strategies for implementing ER in the network", discussions related to the "choice of units, forms of presentation and professionals that would be trained initially ". It was decided, then, for five units: a small BHU, a medium and a large BHU; a medium-sized FHS and a large one. However, despite what was planned, RESP2, MAN1 and MAN2 decided to "carry out on-sight training according to professionals' availability and acceptance and the technological apparatus available in each BHU (number of computers, access to *internet*, network cables, among others)"; therefore, the parameter initially established is not followed.

Thus, the ER implementation, according to the understanding of some participants, occurred [...] *at random and according to the availability of professionals, with nurses and physicians being trained first. At first, medical professionals put up a certain resistance, claiming that the new system could interfere with the service time, which would compromise their schedules. On the other hand,* [physicians]*, more traditional, expressed difficulties in accessing and handling ER* [...] (RESP2). In this regard, RESP2 offered to assist each professional individually, accessing the system, filling in fields and explaining the use of ER (ON). Thus, *gradually, professionals, at first resistant, proved to be safer and more confident* (RESP2). This training process was repeated in the various units where ER (ON) was implemented. At this point in the network, RESP2 was fundamental for the mobilization of other actors, aiming at an effective implementation.

Another non-human, a group of WhatsApp, emerged on the network as an important mediator enabling the exchange of information among health professionals about the technology being implemented. We observed that, based on the constant discussions in this group, changes were suggested in ER aiming at a better compatibility of the innovation with the work process (ON).

The pressures of higher levels of management also influenced the process of implementing ER in the studied city. Many pointed out RHS, representative of the State Department of Health (SDH), as an instance that pressed the ER implementation in the municipality. Thus, in this process of following the actors on the network, the researcher sought to unveil this pressure for implementation, being referred to this connection point. In RHS, RESP RHS, for monitoring the PEC implementation in the municipalities, recognized that "the Ministry of Health defined the year 2013 as an initial milestone for implementation". In the meantime, the MoH has published some guiding RDs, such as Ordinance 1.412, proposing SISAB and the Implementation Manual with the Brazilian National Guidelines for the e-SUS AB Strategy Implementation. Moreover, to support the implementation process, the RHS's technical manager informed that *the Ministry hired a consultant, who was in each municipality to be supporting this implementation. And, since last year, it has made the availability of computers available to teams* [...] *the State has offered one piece of equipment per Basic Health Unit* [...] (RESP RHS).

In a RD, a report published on the MoH's website confirmed the mandatory and the deadline established for the ER implementation in Brazilian municipalities: [...] *we gave a deadline until December 10, 2016 so that all systems are integrated to the Ministry of Health* [...] *just make the integration* [...] (RD).

Contributions and weaknesses shaping the electronic medical record as a controversy in effervescence

After better understanding the process of ER monitoring and implementation by RHS, the researcher returned his contacts with those responsible for the process in the MHD, in order to continue the proposal for training professionals in the use of on-sight ER. Thus, the first visit to the health unit, called FHS1, was carried out. The first actor followed was a nurse (NUR1), who introduced professionals and showed the unit. The team consisted of a physician, a nurse, a dentist, a physiotherapist, a nursing technician, an oral health technician, an oral health assistant and four community health workers (CHW) (ON). In the unit, daily consultations are carried out by these professionals, in addition to pre-scheduling and home visits.

At first, in FHS1, only NUR1 and PHY1 used ER, as only these two professionals would have received training in the use of technology (ON). In addition to the professionals and the work process, we also observed the precarious conditions, which, in a certain way, influenced the ER implementation, weakening it: [...] *the health unit operates in a residence rented by the municipality. Right at entrance, users are faced with difficulty in entering due to lack of basic structure, lack of space, difficulty of access. The rooms are inappropriate for good service. The professionals had access to the internet through a network cable donated by a school in the neighborhood* [...] (ON).

In nursing consultations, following NUR1 in the use of ER, we noticed some questions about how to "return from the previous screen", the fact of "not being able to print patients' reports" and "difficulties in placing a nursing diagnosis", making it difficult the operationalization of the consultation. Furthermore, we observed that the nursing diagnosis, for nurses, represents a controversy, because, in ER, the available diagnosis was restricted to medical diagnosis. In this case, nurses and other professionals used the International Classification of Primary Care (ICPC 2) (ON) device.

It is interesting to realize that, in the first health unit, professionals were involved in the ER implementation, promoting suggestions for changes in its functionalities: [...] *we had our participation... previously, the programs and guidelines are always dictated from top to bottom and stick to it. With the opportunity for us to be helping to improve the electronic medical record with suggestions, it is being interesting* [...] (NUR1).

When participating in a medical consultation at the same health unit, PHY1's difficulty in handling ER was notorious due to its lack of ability as well as filling in other available fields (ON). When approached about his difficulties, he mentioned *little time in the use of technology and little technical skills in the area of computers* (PHY1). Despite his difficulties, he acknowledged that *perceives the use of the electronic medical record as a valuable work tool*, and that *technology can help to streamline access to patient information, contributing to assistance*.

In the trajectory of following the network, the researcher was sent to another unit, BHU 2, where there were already professionals trained in the use of ER. Upon admission to BHU 2, the researcher was received by MAN2, and ER was introduced to health professionals. When accompanying a nurse, NUR2, in a childcare consultation, reported *difficulty in using the medical record because it was still new*, as she was used to *launching through the paper chart*, where the information of patients' history *was already contained.* She believed that *over time, after using the data, the medical record will become easier and more effective*. However, dhe reported *difficulty in registering child data, making it necessary to read the paper record since the information had not yet been passed to the electronic*

record. With that, *is lost a lot of time, some screens of the electronic medical record are still not suitable for child care.* In another scene, we observed: [...] *PHY2 performed care for a three-year-old child, complaining of lack of appetite and general malaise, performs the physical exam and records the data in the electronic medical record. Presents difficulty in typing and using the electronic medical record, demonstrates the lack of technical preparation in the use, being unable to proceed on the following screens, makes reference to the paper medical record, as all of her previous consultations are already written* [...] (ON).

Continuing to walk in the network, the researcher was activated by the RESP1 of FHS2 due to ER being already implemented and the team trained and with greater adherence to technology. We found a great mobilization of human actors, NUR3, PHY3 and RNUR1, in the use of ER. Seeking to understand the mobilization, acceptance and receptivity to the new technology, the researcher decided to interview them. The actors highlighted some contributions of ER to the daily work: [...] *in the electronic medical record, all professionals have access to the history of that user at the municipal level* [...] *we can get a better view of that user, especially users who go to the ECU that we, until then, had no knowledge of what was done there. The question of exams is easier than just going separately* [...] *we can see everything on a single screen* [...] *medical prescriptions are recorded in the medical record; when necessary, just reprint* [...] (NUR3). Another interviewee emphasized information sharing and readability: [...] *you can share the information with professionals* [...] *because you take a written medical record and you don't understand anything and in the electronic medical record you don't have this problem* [...] (RNUR1). Another participant highlighted the contribution of ER in monitoring patients through the points of the care network: [...] *when you open the electronic medical record, you can already see the medicine patients use, you can see how many times they went to see it there at the ECU, I do a better follow-up* [...] (PHY3).

However, difficulties were also pointed out in this health unit, highlighting the lack of access to medical records by mid-level professionals, often making assistance by these professionals difficult. So. it was highlighted: [...] *if a person arrives who says that he was at the ECU, that they were feeling sick, my nursing technician has the ability to provide care, but they have no access to this information. Until that moment, in the electronic medical record, only those who access have higher education* [...] (NUR3). Another difficulty mentioned was the lack of a window for quick consultation of a patient's medical record, or a specific pathology or condition mentioned in patients' clinical history, without having to review the entire history of the previous patient: [...] *I still don't have the ease of wanting to see any patient more quickly. I have to look for patients' Health Information System code, open a new service, which can generate duplication, this is a problem* [...] (RNUR1).

The researcher continued to follow the ER implementation in two more units, FHS3 and FHS4, as they were identified by other actors as units where the technology was in full operation, in addition to the team of professionals having already received training. Predominantly, NUR4, NUR5 and RNUR3 were followed, as they conformed as mediating actors in the implementation and use of technology, in addition to mobilizing other actors in the network. They recognized ER as an innovation *for care management* (NUR5), as well as a facilitator for *visualizing patients' path at other levels of health care* (NUR4).

The discourse on the use of paper records at the same time as the electronic one emerged: [...] *they* [managers] *do not yet know how these paper records will be. But, as patients arrive, we are taking notes in their paper record, and then evolving in the electronic chart* [...] (NUR4). Other inquiries emphasized *weakness in the retrieval of information from the electronic medical record* (NUR5). In this regard, nurses would have to *read the entire chart, or several to find patients' desired data*. Additionally, there was a need for *integration of the electronic medical record with other information systems* (RNUR3).

DISCUSSION

The ER implementation involved a human and non-human actors network with multiple connections. We found that the MoH has defined Resolutions, Ordinances and Guidelines guiding the implementation process. Non-humans are impregnated with intentions, representing impositions and pressures for implementation.

SDH and RHS managers followed the process based on demands for compliance with regulations in the municipalities. Professionals in the city, on the other hand, felt pressured to adopt the technology, developing and using other artifacts: SOP, aiming to standardize the use of technology, and WhatsApp, in an attempt to answer questions about the implementation. This cascade of events, in multiple connections, emphasizes non-humans (resolutions, ordinances, guidelines, SOP, WhatsApp) in their relationships and as mediators (emitters of effects) of the ER implementation, as they mobilized the network of actors, awakening related behaviors technology deployment.

In the light of the principle of symmetry, a concept that originates from ANT, non-humans are also endowed with agency capacity, as they transform the network, influence processes and other actors.[15] Recognizing them is essential, as their influences must be discussed and channeled towards the successful implementation and use of technology. It is not a matter of understanding non-humans as entities endowed with reflexive and independent capacities; conversely, the agency of non-humans, in ANT, emerges from the interaction with humans and their production by humans, who inscribe their intentionalities and transformations. The agency capacity of non-humans depends on understanding them as a network actor[15] and their performance is intrinsic to the connections established in the network and in its weaving.

The norms, as non-human components of the network woven in the municipality, were also steeped in punctualities at the state and federal levels, influencing the daily work of professionals in the municipality. This finding demonstrates that the network of actors involved in the implementation of a technology is not only local, even if the investigative process starts with more localized settings, such as a municipality. What we see are multiple connections established between human and non-human actors from various spheres of activity, influencing the process of implementing and adopting a technology. The punctuations[15] in a network are representations of the intentionalities of the multiple actors from different spheres of action that end up exercising their effects on the relationships that are established. Therefore, it cannot be said that one network is local and another more global, since the network is a relational construction, where actors interpenetrate themselves in connections and influence relationships.

We cannot consider regulations as non-human guaranteeing the implementation per se, despite considering the agency of these actants. In Brazil, the implementation of Information Technologies in the context of public health still occurs from the definition of federal and state regulations, which end up putting pressure on the adoption in the municipalities.[18–19] Such regulations are not always agreed upon by a collective movement involving professionals, users and managers who are in the municipalities, generating resistance and weakening the computerization process.[18–19] Thus, the finding that the network woven during the implementation of an ER is hybrid (human and non-human) and has multiple connections (not just local) triggers the need to empower an innovation incorporation process that consider such hybridity and its multiple intentionalities, aimed at the success of the implementation. Technological incorporation in this context must be planned, implemented and assessed on an ongoing basis and considering the various actors, representing the different spheres of interest.[20]

Several human actors (health professionals, managers, and technicians) emerged on the network as mediators of the implementation, exercising their agency based on translations of the process of technology implementation and adoption. They mobilized in order to make the implementation feasible by discussing and deciding which technology to deploy, sharing information about the technology, developing and receiving training, conflicting opinions and developing synergism. Their discourses of resistance and perceptions about the impacts of technology on care and work routines were impregnated. They are humans, manifesting their capacity for agency[15] through translations, expressing their intentions and fomenting controversies.

Translation is configured as a process whose action is always displaced and transformed into another, involving deviations from the route and articulations, in which the elements express strategies of interests, influences, acts of persuasion and other elements in their own language.[15] They are always imperfect, as they signify the appropriation that each actor makes of what circulates on the network.[16,21–22] Thus, ER being implemented is given a new meaning in terms of intentionalities and circumstantial pressures (rules, incompatibilities, deficient infrastructure, among others) present in the network in tension. These translations are configured in a natural and dynamic way, they are inherent to the relationships woven during the construction of collective associations.[15,23]

However, translations of the use of ER should not be detrimental to the work process that is established in the care network. The technology must be used in order to mediate the recording of information and the safe guidance of assistance. The data stored in ER must be reliable, reliable and compatible with reality.[4,24] Therefore, translations of the use of ER must be interpreted in the sense of recognizing their needs for improvements and adjustments to the daily demands of workers and users.

ER was recognized for its quick access to information; support in decision-making; information tangibility and legibility; instant and continuous updates of information providing knowledge of the flow of patients in services, reducing information duplication. However, weaknesses have also emerged, such as infrastructure deficiencies; weaknesses in internet access; lack of qualification of professionals to use the technology.

Initially, we could analyze this result as a paradox (contributions versus weaknesses) related to the process of implementing a technology. However, dichotomies exalt a reductionist and technical vision, where the technological artifact is understood as an instrument that, due to inadequacies in its software, hardware and other technical components, would be preventing its own implementation and adoption.[19,22] It is necessary to understand the implementation of a technology as a controversy in effervescence and mobilizing other controversies.[17,25] Such technological artifacts surrounded is by conflicts, disputes and contradictions emanating from a network of actors in constant relationships (connections), forming an open debate.[25–26] Therefore, considering the ER implementation involves listening to disagreements between the actors involved, understanding the situations where they disagree. Controversies start when actors decide for disagreement, do not ignore each other and end when they make a commitment by consensus that potentiate collectivities.[25] Moreover, controversies must be understood as boosters of evolution, of opportunities for collective debate, where actors' involvement is fundamental for understanding its dynamism.[15.17]

We cannot ignore the fact that the success in the ER implementation depends on technological structure provision, in order to train professionals and to strengthen permanent education processes and to raise awareness of professionals, managers and users about the importance of such technology.[4,9,18–19,26]

However, considering the implementation of technology as a controversy, it is necessary to promote strategies that contemplate its characteristics as such: controversies must be continuously debated considering its dynamism and constant transformations; controversies involve considering the agency of humans and nonhumans and their relationships; controversies are impregnated by the intentions of different actors, whether they are individuals or institutional positions; controversies are resistant to reducing complexity; controversies involve distributions of power.

This time, the success of the ER implementation depends on a continuous debate and aligned with the constant evolutions of the technology, of the related norms and of the transformations provided in the daily work and in the relationships between the actors involved. We cannot expect an immediate implementation process, which is summarized in the use of technology to its maximum potential, as it is an evolutionary process and full of translations that, at the same time, will be developed. The challenge is to channel, over time, translations aimed at implementation and adoption. Furthermore, we cannot reduce the complexity of implementing ER as a simply local process, dependent on the attitudes of human actors who live there, as the network is hybrid (human and non-human), complex (several connection points punctuating intentionalities), and permeated by power relations (defined and institutionalized norms, but human actors who translate them into their modus operandi).

We recognize the dynamics of the technology implementation process and the need to monitor its evolution over time, pointing out the limit of this study in mapping controversies of a historical outline and of a specific reality and making generalizations impossible.

CONCLUSION

The studied ER implementation network is hybrid (of humans and non-humans), has multiple connections (it is not only a local network, it is influenced by the state and federal spheres of government), being woven from two main controversies: multiple actants and their translations influencing the ER implementation; contributions and weaknesses shaping ER as an open controversy. Despite the weaknesses related to infrastructure and qualification of professionals to use the technology, we emphasized the finding that the technology being implemented, even in its initial phase, already presents contributions, such as supporting clinical decision-making, monitoring of patients' health history and evolution, and integrating information between professionals and between points in the care network.

ANT and Controversy Cartography have become important frameworks for understanding the object from a sociotechnical approach, turning the investigative look to the relationships between humans and non-humans established in a network. The importance of new research that assesses the implementation of new informational technologies in the work process of health and nursing professionals is emphasized, and how such innovations influence care management.

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NOTES

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APPROVAL OF ETHICS COMMITTEE IN RESEARCH

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CONFLICT OF INTEREST

There is no conflict of interest.

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