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Incorporation of information technology in Primary Care of SUS in North-eastern Brazil: expectations and experiences

Marília Gava¹
Lisiane Seguti Ferreira²
Dario Palhares²
Eduardo Luiz Andrade Mota³

Abstract *The incorporation of information technology (IT) via an electronic record of health data in primary care is transforming the organization of labor and professional practices in Brazil. The scope of this study is to establish the expectations and experiences of incorporating IT in the primary health care of the Unified Health System (SUS) with the implementation of the National Health Card System (SCNS). It involved qualitative research with 50 interviews and 96 questionnaires comparing the opinion of health professionals about technological innovation in locations with the SCNS and where it has not yet been incorporated in the cities of João Pessoa and Aracaju, respectively. The expectation was that IT would speed up the work schedule, which was not confirmed at the location where the SCNS had been incorporated. IT can improve labor organization, the flow of data and information and enable the digital insertion of the professional. The “light” technology of health care cannot be expedited by IT, as it is necessary to impart knowledge to the professionals. However, it can improve working conditions by data gathering and organization, giving immediate feedback to the professional recording the data and enhance the ability to manage health policies.*

Key words *Information technology in health, Incorporation of IT in health, SCNS card, Labor process in health*

¹ Superintendência Regional Norte/Centro Oeste, INSS. SEPS 712\912. Edifício Pasteur. Bloco I, sala 111. Asa Sul. CEP 70390125. Brasília DF Brasil. mgava00@hotmail.com

² Hospital Universitário de Brasília, Universidade de Brasília. Brasília DF Brasil.

³ Instituto de Saúde Coletiva, Universidade Federal da Bahia. Salvador BA Brasil.

Introduction

The Brazilian public health system, or *Sistema único de saúde* (SUS) as it is better known, is a nationwide exercise of immense dimensions, covering as it does, over two hundred million Brazilians by providing services of vigilance, medication, and organ transplantation, to name a few. Barring 24.7% of the population, which is covered by private health insurance¹, more than 150 million Brazilians depend on SUS as the only source of health attention. The magnitude of the annual services provided is considerably impressive: over 2 billion outpatient care procedures, 11 millions hospital admissions and in-patient care, two hundred thousand cardiac surgeries, and one hundred fifty thousand vaccinations².

Efficient management of such a complex and extensive system requires the support of informatics and information technology, and is one of the biggest challenges facing the hospital management personnel, healthcare professionals and informatics experts alike, both in terms of procedural design, as well as accessibility to the concerned people.

The purpose of promoting the innovative, creative and transformative aspects of technology by Brazil's National Policy of Information and Informatics in Health³, is to improve healthcare routines, and construct a well-articulated National System of Health Information that can generate and provide knowledge and information to citizens, managers, and professional practitioners, and additionally, exert social control over the Health System.

Traditionally, SUS develops health information system procedures to suit the requirements of management practices, monitor health situations, control productivity and transfer funds from actions and events. Also taken into consideration are administrative rules, managerial interests, and deficiencies of existing health policies that stop short of fulfilling the needs of healthcare providers and the services itself⁴.

The registration of data by the health care providers within the purview of the SUS health services, follows a centralized mode that is both disorganized and fragmented in logic⁴. The procedure begins with filling of forms by the user at the time of entry into the primary care center, and includes the collective actions of health promotion, community mobilization and also inter-sectoral information⁵. The system of data collection is independent for each center, and becomes collective information only after reach-

ing the relatively more elevated management hierarchical levels⁶. When data is consolidated at the management level in townships, states, and ultimately, the Health Ministry, it is converted to organized information which unfortunately, rarely returns to the concerned professionals, thus distancing them from the nature of issues addressed, as well as mode of action.

The pilot project of the National Health Card System (SCNS or *Sistema Cartão de Saúde*), also referred to as *Cartão SUS*⁷, was launched by the Ministry of Health, in order to provide a one-way identification procedure for users, professionals and health facilities of the SUS. The project involved hiring of companies for creating specific tools to enable registration of essential categories of data in health through service terminals of the SUS (known as TAS or *Terminal de Atendimento do SUS*), a step that was necessary to feed the information systems of SUS directly from the end-user. It must be emphasized here that this project did not aim to be merely a simple electronic record of clinical data, which would just be a documentation of the patient's detailed case history, being made available throughout the healthcare network.

The newly designed SCNS has the advantage of knowing every user of the SUS, and managing patient care across all its health care services, carried out by the diverse entities of health. This novel approach provides visibility of essential data for feeding into the information systems. Vital information thus permeates every moment of management, of social interaction involved in the trinomial process of health-disease-care, and the diffusion of results that gives feedback about the decisions taken and treatment being followed⁸.

It is expected that computerization of the entire procedure will (i) improve the quality of registers; (ii) ease usage of feedback information by the practicing health care professional, and (iii) reduce the distance between the data register and the user of information.

One of the challenges facing this task is the amalgamation of ergonomic studies with the physical and cognitive approach during development of the technological solution, in order to incorporate reality where the person is concerned; in other words, 'understanding labor to improve it'⁹, i.e., to analyze work activity to facilitate the creation of new and best methods, while preserving the physical, psychic, mental and social lives of health care workers¹⁰.

The present paper has the following objectives: To make a comparative study of the con-

crete experiences during data registration and usage of information, between one center where informatics had been introduced, and another one which followed the traditional system for registration of data. To identify the expectations of health care professionals about informatics, before it becomes a reality. To study the experiences of people who work in places where this technological innovation has been introduced. To evaluate the factors that may influence the adherence of the professional to the new system of working.

During the implementation of the pilot project of SCNS, some conflicts were observed regarding changes in the daily routine of professional practices, due to a disruption of set, habitual practices acquired over years of working. This was probably related to resistance to the procedure of data registration. Hypothetically, the resistance shown by health care professionals would more likely, be related to problems and delays created by the new procedure of working, rather than an overall antagonism towards computers.

The present research project is based on the principle that the ergonomic study of the practical aspects of work before and after technological innovation, is important to modify and minimize changes. The study questions whether the electronic health register obstructs ongoing work and if so, whether this could be the reason for resistance, in which case, outline the remedial measures to be adopted.

Methodology

A transversal qualitative and comparative study was conducted to evaluate the perceptions of professional healthcare workers¹¹, who collected and recorded data about patients' medical history/ongoing treatment at primary care centers, during the year 2005. Units providing primary health care, that were following/not following the Health Card System (SCNS) were compared for work procedures. These units will hereafter be referred to as 'With SCNS' and 'Without SCNS'.

The municipality of Aracaju, which is the capital of Sergipe state in Brazil, was selected as representative of a working unit 'With SCNS', for the following reasons. Implementation of the Health Card system had been launched in year 2000, and the pilot project was regarded as a role model, because the city's primary care centers retained the original concepts and at the same

time, were successful in producing results with 'Cartão SUS' that were close to expectations¹². Among the 44 cities covered by the pilot project, Aracaju had progressed considerably, broadened the tools and integrated the system of data registration of primary care with the specialized chain and the system of complementary medical examinations¹³. The local management formulated rules for the control, evaluation, auditing and demand regulation of functions, and laid down guidelines along which the primary chain could classify risks and severity of patients' conditions, allow proper selection of priorities, highlight the most needed ones, and search for equity and social justice.

The city of João Pessoa, capital of Paraíba state, Brazil, was chosen to represent a hypothetical situation before computerization, or 'Without SNCS', as it is geographically close to Aracaju, and similar in regional, environmental and population characteristics.

A total of seven primary care units (five covered by the Family Health Program (PSF) and two 'traditional' outpatient clinics with specialists on their panel), were selected based on the following criteria: acceptance of the research by unit managers, permission for the researchers to fill out questionnaires and conduct and voice record interviews during working hours. Data harvesting was carried out by the same researcher who had earlier followed the procedures for implementation of 'Cartão SUS' in Aracaju. The tools of data harvesting included the questionnaire, an itinerary of interviews and the diary of field work.

Participation by health care professionals was entirely voluntary, and under informed consent. Of the total number of persons interviewed, 96 completed the questionnaire (40 'Without SCNS' and 56 'With SCNS'). 50 interviews were voice recorded (32 Without SCNS and 18 With SCNS), and transcripts prepared, each of 20 to 40 minutes duration.

The nature of occupation and number (in brackets) of the sample subjects in the two selected cities of João Pessoa and Aracaju, were, respectively: community health agents (11 and 18); physicians (9 and 16); nursing and dentistry assistants (8 and 6); nurses (3 and 6); dentists (3 and 3); managers (1 and 2); other professionals of superior level like social assistants, psychologists, educational psychologists, nutritionists, speech therapists and pharmacists (5 and 5).

The personal questionnaire comprised subjective questions about perceptions of the pro-

professionals with regard to the following topics: (i) views about the data register; (ii) personal experience with computers in general; (iii) perceptions about existing facilities, and the possibility of advancement with/without the aid of computers; (iv) difficulties or limitations when using computers to register information; (v) aspects of work conditions that need revamping in the new situation, before (anticipatory) and after computerization; (vi) familiarity with patterns followed by the SUS systems of information, and (vii) some specific aspects of the computerized system.

Questionnaires filled by the professionals were interpreted theme wise, as follows: Theme 1 – based on the choice of alternatives; Theme 2 – by the option of yes or no; Themes 3 to 7 – by the degree of importance, need or knowledge assigned (given by rating on a zero to five scale). The answers were classified and grouped into three categories: 0 to 1 – few; 2 to 3 – intermediate, and 4 to 5 – high. For data analysis, the following types of software were used: Epi-Info 2003 version and Excel 2003.

Covering the same topics as the questionnaire, the interview method was aimed at getting information about the practices being followed.

Results

Results are presented according to the topics covered in the questionnaire, complemented by information provided in interviews. Graphs make a comparative representation of data ('Without SCNS' and 'With SCNS') from questionnaires, expressed as percentages. Differences above 10% between the two municipalities, and agreement above 50% among the professionals who rated topics as 'high' (4 to 5) are highlighted. The results were divided into five groups, as given under.

Profile of the health professionals who participated in the research

In the city of João Pessoa, which followed the traditional ('Without computer') system of data registration, 55.0% of the participants worked with the PSF (Program of Family Health), whereas Aracaju ('With computer'), recorded 68.0% participants – mainly women – working on the project, with an overall participation of 82.0% in the two cities. 60% participants totaled 40 hours of work per week; the percentage figures for specialists and persons with higher level of educa-

tion were 60.0% and 55.0% respectively, with the remaining workers being educated only up to the high school level.

The age group of participants was between 21 and 50 years, slightly more elevated in João Pessoa. 58.0% had more than 15 years of professional experience, while 25.0% had less than five years experience. Figures for work experience in Aracaju were 32.0% (more than 15 years) and 38.0% (less than five years). With regard to work at SUS, a majority of the participants had been hired since less than 5 years: 58.0% in Aracaju ('without computers'), and 85.0% at João Pessoa ('with computers').

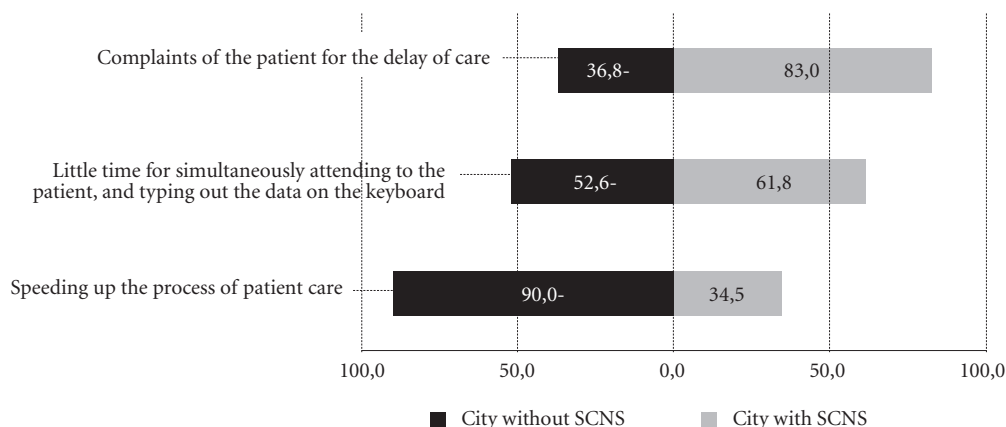
Repercussions related to the time for data registration over the work procedures

An obvious change brought about by implementation of the computerized system, was the substitution of handwritten registration forms with typed computer forms. Data on expectations about time revealed that, in João Pessoa city, where the system had not yet been computerized, 90.0% participants anticipated that the registration procedure would be shorter after computerization, but data from Aracaju, the computerized city, indicated that only 34.5% of the professionals agreed that this would happen (Graphic 1). At João Pessoa, perceptions about the possibility of complaints from users about delays prior to treatment, were low. In contrast, this was a frequent complaint made to 83.0% of the professionals at Aracaju. As perceived by 61.8% of the professionals ('With computers') against 52.6% of the professionals ('Without computers'), the need for simultaneously attending to the patient, and typing out the data on the keyboard, increased the time taken to complete consultation.

Data from interviews indicated that the time taken for both manual and electronic data entry was short. The participating professionals (João Pessoa) felt that manual registration required time but was easy; professionals at Aracaju said that more time was needed than before, because speed and efficiency with computers needed specific training in addition to strategies of adaptation.

I had too much difficulty because we are not used to this new system..... When it comes to the family's health, you need to give detailed information (Physician – PSF – 'Without computer')

Data from the interviews indicated that there is a certain consensus regarding the positive role



Graphic 1. Percentage of professionals who agreed with the items related to limits of time at work.

“Agree” – this was considered for values 4 and 5, and affirmative answers to each item. Percentage was calculated over the total number of professionals who answered each item.

of informatics in (i) speeding up the process of patient care, and (ii) facilitating usage of the documented information to solve health issues

It would considerably diminish all this bureaucracy.... Everything would be more accessible (Nurse – PSF – ‘Without computer’)

In the manual system, the flow of specialized procedures was commenced with manual filling of forms, and the clue for identification was the patient’s phone contact with a central number, which was considered a slow process.

The consultation time that we lose as a result.... We keep on trying, trying, and trying the phone number for half an hour, and we fail (Nurse – PSF – ‘Without computer’)

The increase in time consumption after computerization was one of the main problems for professionals’ non-adherence to this system for capture of electronic data.

This is the biggest complaint..., the complaint is related to the time taken... We deal with some resistance, however, they register without precision... they say that too much time is lost with TAS, it is slow (Manager – PSF – ‘With computer’).

Registration of official codes and/or names is essential to cut down procedural time, and increase consultation time, but this aspect was generally neglected in manual registration. Ignorance of correct medical terminology necessitated time-consuming search trials that needed adapting to. For example, registration of a hyperthyroidism case required the professional to

search by the standardized first name listed in the International Classification of Diseases, which is thyrotoxicosis [hyperthyroidism].

On one occasion, I took about 40 minutes searching for the cod of nip [and not bite].... Sometimes the machine goes out of order, and we have to switch it off and re-start it..... The codes are very large” (Physician – PSF – ‘With computer’).

During the implementation of SCNS, there was a continuous process of refinement. Initially the network connecting the units with the regulation sector, needed to be dialed up, but with time, the units graduated to an online network system, and delays, if any, were related to the breakdown of the system.

Prior to computerizing, request for medical examinations and complementary evaluations were controlled by health care workers, who issued (quota wise) printed paper forms for this purpose. The data for scheduling appointments was transmitted by phone or internet to the higher authorities. The integration of the primary care centers to the regulation sector altered the scheduling of appointments/procedures, and came to be intermediated by TAS.

This is good for the patients, as they don’t need to go out of the unit, they don’t need to repeat the initial process at the reception every time they have an appointment, every fifteen, twenty days, or once/twice a month.....it can be resolved without the need of a doctor’s consultation (Administrative assistant – PSF – ‘With computer’).

When there are genuinely no vacancies in hospitals, the doctor prioritizes cases according to risk factors, and relegates less serious cases to the bottom of the list, so that the patient is unaffected by the quota system, and leaves the consultation room with an officially written request for the necessary diagnostic tests.

Work conditions and the relationship with data registration

The staff in the primary centers at João Pessoa ('Without computers') were unanimous regarding the need to change the existing infrastructure to accommodate technology: illumination (100%), physical space (97.5%), air circulation (100%), temperature regulation (97.5%), and furniture (chair - 100%; table - 92.5%). In the units at Aracaju ('With computer'), the above-mentioned features of infrastructure needed to improve for 49.1% to 68.1% of the staff; moreover, the staff also realized the need to alter the furniture (table - 87.3%; chair - 83.6%). 49.1% of the staff employed in units covered by SCNS complained of osteomusculoarticular symptoms (repetitive stress injury), as against 13.5% in the non-computerized place (Graphic 2).

But we don't have proper infrastructure..... Ventilation, proper illumination, physical space..... proper training could improve many things (Nurse – PSF – 'Without computer').

In the municipality of João Pessoa ('Without computer'), the majority of units of PSF were rented houses adapted for the purpose.

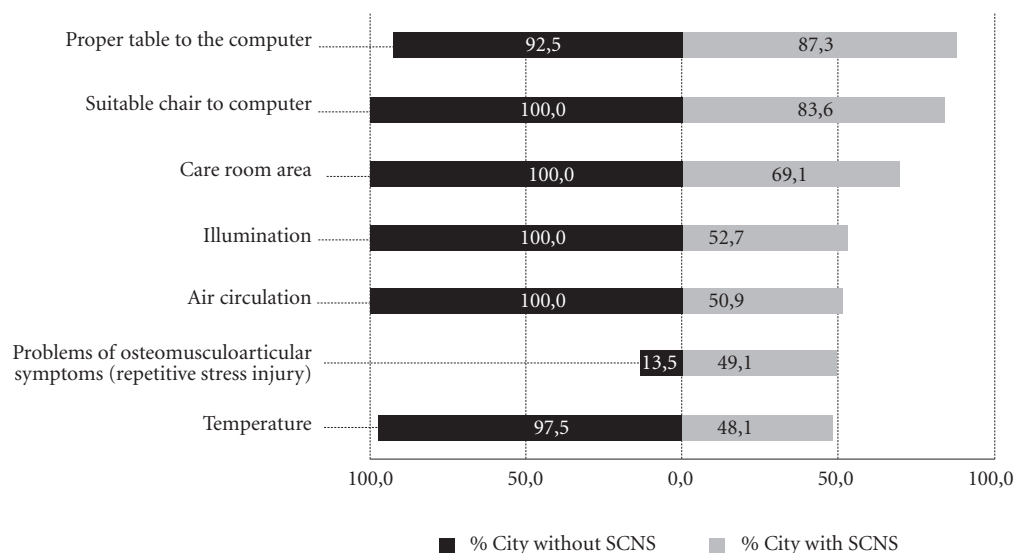
This house is not suitable for a health unit.... look at the pharmacy... There are some closets in the hallway (...) Sometimes when I administer a vaccine, there is a mother here, another there, then a person passes by, and I have to stop in the middle (Nursing assistant – PSF – 'With computer').

The common unit 'without computer' presents structural and/or construction problems:

The lack of structure, the physical space, too many things need to change..... That room..... is bigger, more aired..., they built a wall and it turned into two clinics, but with only one hammock for both of them! (Physician – non PSF – 'Without computer').

At Aracaju ('With computer'), complaints were mainly related to ergonomic questions of furniture and equipment:

The machine was placed improperly..... the machine occupies half of the wall space, but there is no suitable chair, the keyboard is not properly



Graphic 2. Percentage of professionals who agreed with the items about the need for improving work conditions.

"Agree" – this was considered for values 4 and 5, and affirmative answers to each item. Percentage was calculated over the total number of professionals who answered each item.

lowered..... The worst part is the size of this monitor..... I have to stand awkwardly [bent down], because the light falls on this spot and it is not possible to see” (Physician – PSF – ‘With computer’).

Quality of registration for information usage

A lower proportion of staff from Aracaju (‘Without computer’) were in agreement about aspects of data recovery from patients, and reduction of manual work procedures. A majority of staff disagreed that SCNS had facilitated (i) scheduling of referrals, (ii) diagnosis, treatment and decision making, and (iii) access to information (for patients) about themselves (Graph 3).

52.6% of the Aracaju (‘With computer’) staff found it easier to register the diagnoses coded according to the International Code of Diseases (CID-10), whereas only 21.7% of the João Pessoa (‘Without computer’) staff found it so. Perceptions about facilities accompanying standardization of data was evident in 97.4% of the João

Pessoa staff (‘without computer’) and 70.0% of the Aracaju staff (‘With computer’).

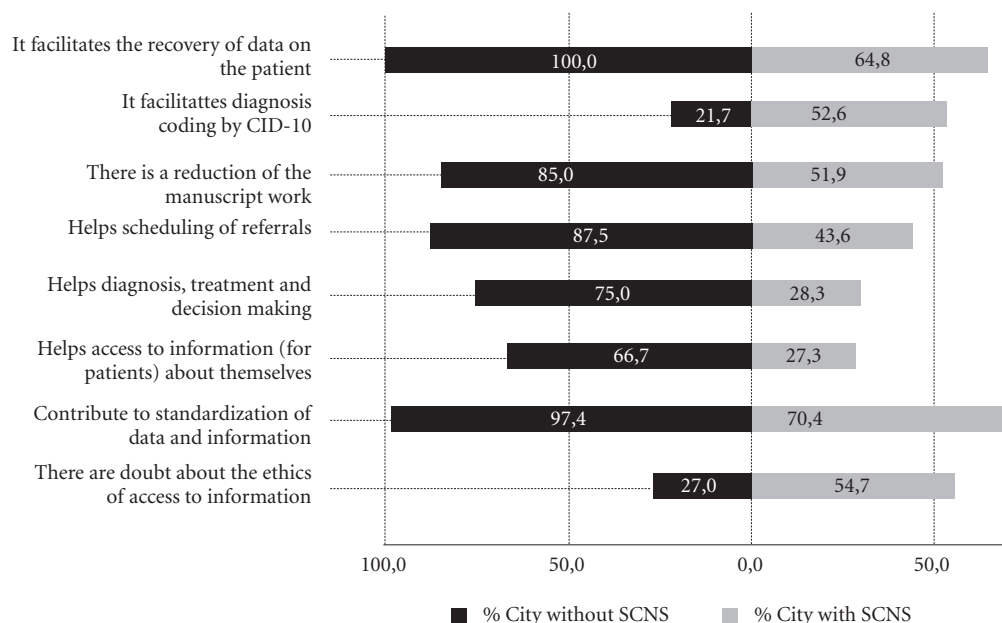
The computerization process of data collection was seen to safeguard medical records against the risks of loss and damage when compared to the traditional manual method of handwritten records.

We have, for example, all the registers of vaccination... Even if medical records are lost, or misplaced due to negligence by the person writing the data, we can recover it (Manager – PSF – ‘With computer’).

The benefits expected from computerization, were expected to bring improvements in work procedures by easing and speeding up recovery of all registered data.

We should have a feedback..... I asked for a prosthesis, I don’t know if they already made it..... They only return when it gets too tight (Dentist – PSF – ‘Without computer’).

Realization about the importance of collective statistical data and recovery of individual data (through extracts of consultations), was evi-



Graphic 3. Percentage of professionals who agreed with the items about professional practice and data quality for managing information.

“Agree” – this was considered for values 4 and 5, and affirmative answers to each item. Percentage was calculated over the total number of professionals who answered each item.

dent in the primary care units ('With computer').

In the case of a hypertensive patient, you can see if he is being monitored....., take an extract of the consultation.... obtain statistical data..... It is a good tool" (Nurse – PSF – 'With computer').

Ultimately, the usage of information was related both to the '*modus operandi*' and responsible professional practice, which made visible the good quality of service, and imparted more confidence to the uses of information in epidemiology and planning of action.

The staff are already able to make a better evaluation about the diagnostic examinations that are really needed.... We increased the number of notifications by 70% (Manager – non PSF – 'With computer').

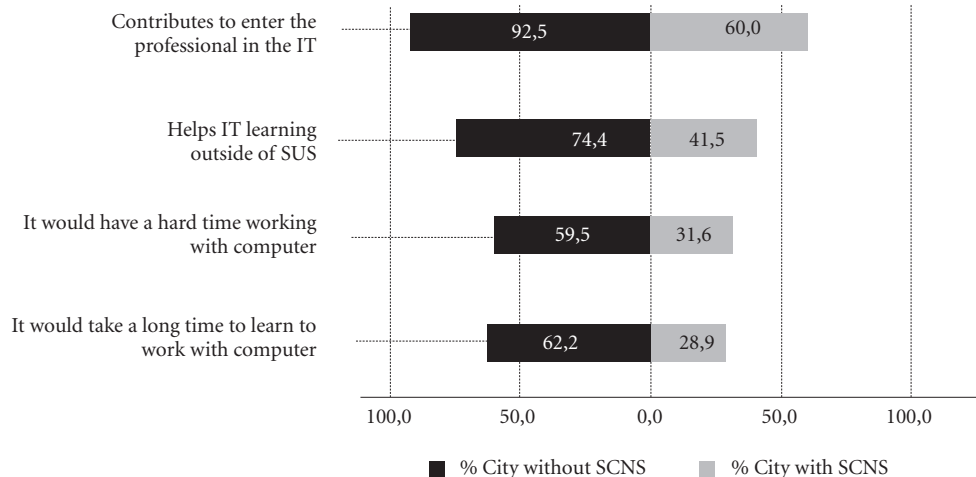
SCNS was of great value to managers: it gave visibility to the guiding principles of SUS, improving the access of population and equity in the services.

Since the 'Cartão SUS' was implemented, the patients on reaching the unit, have access to their needs.....a way of care.....If they enter the system, they go to a regulation site; depending on severity of their case, they will be given priority over others (Manager – PSF – 'With computer')

Introduction of technology and the digital inclusion of health workers

Digital inclusion is the ability of individuals/groups to access and use technologies for information/communication. The introduction of technology in SUS is a step towards digital inclusion, and 92.5% of the staff working in non-computerized systems expected this development to take place; 60.0% of the staff accepted it as a reality; 31.5% of SCNS staff believed they had no difficulty in using computers, and 59.5% foresaw some difficulties. Technical expertise in informatics was expected to take longer for 62.2% of the workers ('Without computers'), and 28.9% staff ('With computer') felt that learning would take a long time. Graphic 4 shows that 41.5% of staff ('With computers') appreciated that this training helped in using technology outside the workplace at SUS, and 74.4% ('Without computers') felt the same way.

Although the staff at Aracaju ('With computer') considered it important to computerize the registration procedure, and go one step further by using still more advanced technology, TAS did not present the complete range of a computer's functionality.



Graphic 4. Percentage of professionals who agreed with the items about personal relationship with computers.

"Agree" – this was considered for values 4 and 5, and affirmative answers to each item. Percentage was calculated over the total number of professionals who answered each item.

Technology is part of evolution, we have to move towards it... Only when it is applied we start facing some difficulties [...] (Nurse – PSF – ‘With computer’).

In brief, it may be said that, as the process of electronic registration approaches and incorporates the aspects of software and hardware of universal usages, it will enhance the healthcare professionals’ perceptions of digital inclusion.

Discussion

Profile of staff participating in research

In the field of health care, the process of computerizing does not necessarily lower the requirement for number of employees, unlike in other workplaces like banks¹⁴. However, the computerization process makes managers and health care staff responsible and accountable for the way they use this technology. Therefore, it compels them to learn and acquire abilities beyond health care, such as understanding terms/tables/coding, which are incorporated in the software, grasping new concepts, and applying these in specific areas of their daily routine at the workplace.

After initiation of the computerization process, the need arose for adapting to the internet, and incorporating/improving procedures that were previously neglected in the non-computerized style of work. For example, the medical data registers of SUS needed frequent updates to guarantee precision while identifying users in all phases of the integral health assistance program.

The implementation of SCNS motivated local managers to invest in improvements such as: organization and orientation of work towards a digital style of management; construction of proper health units; improving job plans and careers; carrying out public selections; hiring new employees; developing the required abilities; anticipating new needs of the service, and implementation of the program named *Modelo de Saúde Todo Dia*¹⁵.

The recruitment of new employees encouraged the entry of young professionals skilled in the use of modern technological resources, with the additional qualities of scholarliness and knowledge relevant to the needs of the service.

It may be stated that computerizing of health sector services brought about modifications like adding the task of typewriting to manual writing; creating new logic among users, which formed the basis for their demands on SUS services, and

broadening the scope of professional work, causing them to become ‘polyvalent’¹⁶.

Repercussions of work procedures on time for data registration

One would expect that computerization would speed up at least part of the work process, but contrary to expectations, the present study did not find this as an immediate outcome. The reason behind this is that logic and cognitive abilities suitable for the new technology, are such that specialized training is required for work to attain a certain level of speed. The task of typing the data was added to the responsibility of patient care, and therefore, the time taken for task completion became more, e.g., there was an increase in the number of complaints about delay for seeing the doctor.

Computerization increased the time needed for the physician to finish each consultation. Consequently, professionals exhibited a lack of adherence to the computerization process; these observations were also identified in another research study¹⁷. In the present study, the main causes observed were the need to wait for diagnostic examination outcomes before taking action; the need to document the case, and the frequent need for searching for information.

From an epistemological point of view, technological evolution, particularly regarding health information, provides the advantages of readability, accessibility, and the automatic and fast recovery of data. According to Clancey¹⁸, barriers exist because there is rigidity of software in the areas of interaction with patient care, as programs have not yet developed the capacity to reproduce perceptions, or the ability to improvise and interpret human actions.

Work conditions and the relationship with data registration

The practical implementation of SCNS (mainly by TAS), means a substantial change in the ‘manner of organizing the work itself, and the means of work (knowledge and tools) of the activities in the health sector’¹⁹.

The new physical requirements of the computerization process are perceived by health professionals as factors that increase repetitiveness: awkward posture, the risks of spine problems, and proneness to lesions of repetitive stress injury. The cognitive requirements of the new working style include: need for memorization, focus-

ing of attention, comprehension, perception of hidden pathways within the program, and the functionalities of the system. Overall, the process requires a differentiated approach – a combination of a cognitive intelligence with a unique logic regarding non-computerized procedures²⁰.

The software represents a case of intellectual technology: it molds the cognitive structures of the work organization, modifies care practices, and at the same time, calls for changes in environment and networks that are instituted²¹. The complex domain of health and health care services, influences the integration of technology into a sequence of interactions encompassing shift of values in a central and typical characteristic scenario with complex cognitive tasks²².

The electronic registration system and process must answer ‘questions related to operation, functionality and epidemiology of the services, becoming an instrument of management’²³ for improving the nation’s health system.

The generation of information in this complicated world of health care, must gather concepts and patterns in a way that avoids repetition and redundancy of data registration, allowing the appearance of an integrated information system that attends to the needs of users, managers and staff. The interface of the software and the standardization of information in health, determine the scope of the system’s integration²⁴.

Quality of data for generating information

The daily usage of information (which is very important), will be determined by the quality of technology within the machines being used, and this is what represents the reality of health work. This facility was appreciated by professionals at a point when all the hard work rendered it easy to recover the medical history of patients, and helped in both prognosis and treatment of a case. Progress is inevitable, because electronic registration lowers risks, standardizes concepts that can be grouped together, and gives visibility to actions that make it easy to diagnose and monitor the line of health care, allowing for planning and decision making.

Merhy²⁵ states that technologies are made up of an imaginary comprehension under three types of bags, which for SCNS can be represented thus: (i) hard technology, or the service terminal of SUS – TAS, the connection between net and system architecture; (ii) hard/soft technology, the amount of knowledge of professional practice that is housed in the programs, standardized by solicited

and accomplished procedures, by the operational model and logic of applicatives; (iii) soft technology, or the care itself, formulated by the model of attention, and guided by SUS policies.

To Merhy, the productional restructuring of the health sector, where intellectual work is predominant, overcomes innovations represented by the equipment, or the hard and soft-hard technologies. It is essential to recognize that soft technology has a special significance in the process of production in health²⁶, such that it transforms and reorganizes by determining new innovations in professional care, thereby developing a virtuous circle of innovations.

In primary care, the integrative approach of PSF is innovative, as the health practices reorganize knowledge, identify new problems/needs in health assistance, stimulate other cultural organizations, and guide the trinomial execution plan of information-decision-action²⁷.

Information is of strategic value to professional practice that is associated with the ‘results of its application in planning, programming and evaluating services, for improving both individual care and public health’²⁸. The quality of data aggregates values, and imparts objectivity to knowledge about the health situation and the epidemiologic picture, which will serve as a strategic source for intervention in a given population.

The use of information technology in the field of health, increases the responsibility of the professionals, improves the notification of diseases under vigilance, and reduces the time needed for investigation and intervention in reality. The automatic accessibility of reports frees managers to efficiently pursue their work in managing, controlling, evaluating, and regulating activities and procedures, and reflecting about the social particularities of the area under management.

Participation of technology in digital inclusion of the health care professional

The obligatory use of computers at the workplace contributes to digital inclusion in life outside the workplace as well. As the professional starts working with the machine, there is a greater probability of carrying out other trials of access to computers, and overcoming myths and prejudices regarding technology. In general, the more adequate the technology employed in a specific area of work for the purpose of catering to its specific needs, the greater the inclusion.

Digital inclusion at workplaces, like digital inclusion in schools²⁹, is an opportunity to broad-

en the motivation for using technology at home, during free time, and in community services; that is, it can open up avenues for the advancement of social inclusion of workers³⁰.

Conclusion

The transformation of work procedures in primary care centers by electronic registration of data, as studied in the implementation of the National Health Card System (Cartão SUS), on a comparative basis between two locations with and without computerization, made explicit the realities encountered during health work. The study also elucidated details of organization, and modifications of needs and physical conditions at work. From a futuristic point of view, the entire exercise serves to pave the way for innovations that get re-arranged in a virtuous cycle of professional practices.

Computerization in health does not reduce employment; rather, it increases the need for incorporating other tasks by health professionals, organizes and de-centralizes tasks like data harvesting, and aggregates knowledge, standards and tables of procedures of SUS, which were hitherto distant from professional practice.

The delay in data insertion into the computerized system, is one of the chief complaints of

health care professionals. Technology does not incorporate the real activity of work, and when anticipated benefits (like reduction of delay when attending to patients) are not attained, then the task of typewriting becomes just one more task. The increase in time taken to carry out the task is a sign of disapproval of technology, and can partially explain non-adherence to the newly introduced procedures.

In actual practice, it is not feasible to computerize all the health care structures, as the soft technology present in human interaction is represented by improvising and interpretation of human relations, and hence not reproducible by means of software and computerized systems.

On the other side, the incorporation of information systems technology in health care, directs the production of data closer to the professional who registers the data. Hence, it tends to reflect, with more precision, the reality felt at the edge. In other words, with computerization, there is a questioning approach to the rationality of data registration and its relevance to information usage.

The accumulated experiences of computerization procedures can very well support improvements in health care practices, in addition to increasing the efficiency and quality, measurable by broadening the accessibility, equality, integrality and humanization of health care services.

Collaborations

M Gava responsible for the design, conduct of research, analysis and interpretation of results and writing of the article. ELA Mota, as the guiding thesis, participated in the conception and design, the analysis and review of the results and the article. D Palhares and LS Ferreira edited the text, reviewed data and complement the literature review.

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