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ORIGINAL ARTICLE

Strategies to improve the quality of hospital materials purchased through electronic bids

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Abstract

Objective: To propose strategies for the electronic procurement of materials for university hospitals to be a process focused on the quality of the products purchased, with repercussions on the safety of patients and health care teams. **Methods:** Descriptive study, qualitative approach, carried out with 11 physicians and 18 nurses. Interviews analyzed in the light of thematic content analysis. **Results:** From the data analysis, the following thematic categories emerged: Materials with more problems, interurrences due to lack of quality criteria; Credibility for requesting samples for electronic procurement; and purposes of the hospital materials standardization commission. **Conclusion:** A commission for pre-evaluation of samples was suggested as an essential strategic recommendation for improving the quality of hospital materials. The article does not exhaust the theme but shows the need for further studies on public contracting regarding electronic procurement in order to seek criteria in the pre-evaluation of material samples for university hospitals.

Key-words: purchasing, hospital; materials management, hospital; hospital administration; quality control; delivery of health care.

Resumo

Estratégias para melhoria da qualidade dos materiais hospitalares licitados em pregão eletrônico

Objetivo: Propor estratégias para que o pregão eletrônico de compras de materiais para hospitais universitários constitua-se num processo focado na qualidade dos produtos adquiridos, repercutindo em segurança dos pacientes e equipes de saúde. **Métodos:** Estudo

descritivo, abordagem qualitativa, realizado com 11 médicos e 18 enfermeiros, em 2015. Entrevistas analisadas à luz da análise temática de conteúdo. *Resultados*: Da análise dos dados emergiram as seguintes categorias temáticas: Materiais com mais problemas, intercorrências por falta de critérios de qualidade; Credibilidade sobre solicitação de amostras para o pregão; e propósitos da comissão de padronização de materiais hospitalares. *Conclusão*: Sugerida a implantação de comissão para pré-avaliação de amostras, como recomendação estratégica essencial para melhoria da qualidade dos materiais hospitalares. O artigo não esgota o tema, mas evidencia a necessidade de novos estudos sobre compras através de pregões eletrônicos, para se buscar critérios de pré-avaliação das amostras de materiais terapêuticos utilizados em hospitais universitários.

Palavras-chave: serviço hospitalar de compras, administração de materiais no hospital, administração hospitalar, controle de qualidade, assistência à saúde.

Resumen

Estrategias para mejorar la calidad de los materiales hospitalarios licitados en una sesión electrónica

Objetivo: Proponer estrategias para que la licitación electrónica de compras de materiales para hospitales universitarios constituya un proceso enfocado en la calidad de los productos adquiridos, con repercusión en seguridad del paciente y equipos de salud. *Métodos*: Estudio descriptivo, abordaje cualitativo, realizado con 11 médicos y 18 enfermeros en 2015. Entrevistas estudiadas mediante análisis de contenido temático. *Resultados*: Del análisis de datos surgieron las categorías: Materiales más problemáticos; Incidencias por inexistencia de criterios de calidad; Credibilidad sobre solicitud de muestras para la licitación; y Propósitos de la comisión de estandarización de materiales hospitalarios. *Conclusión*: Sugerida la implantación de comisión de preevaluación de muestras, como recomendación estratégica fundamental para mejorar la calidad de los materiales hospitalarios. El artículo no agota el tema, aunque evidencia la necesidad de nuevos estudios sobre compras por licitación electrónica para buscar criterios de preevaluación de muestras de materiales terapéuticos utilizados en hospitales universitarios.

Palabras-clave: departamento de compras en hospital, administración de materiales de hospital, administración hospitalaria, control de calidad, prestación de atención de salud.

Introduction

Electronic procurement is used in order to make the process of procurement of hospital materials more dynamic. However, when it does not include criteria for the evaluation of samples, it is not a satisfactory procurement modality since it does not prioritize elements of quality, essential in the acquisition of these materials. It does, however, bring speed and cost reduction to public administration [1,2].

It is known that public procurement and contracts comprise procedures with characteristics and components of a commercial nature, involving the negotiation of price and legal proposals, subject to controls [1], bringing of appeals and the imposition of administrative sanctions [2].

It is important to consider in the context of this study that the number of university hospitals in Brazil in 2013 was of 134 institutions distributed throughout national territory, with 80 public, 47 philanthropic, and seven private institutions [3].

According to a study carried out at the University Hospital of the University of São Paulo, the material management system is one of the major determinants of an institution's financial planning, that is, it is in this area that a great expense of revenue is observed and where capital can be consumed [4].

In Brazil, Law no 8,666 of June, 1993, is the main guideline of the processes of public procurement, which was changed, by the wording conferred to art. 3rd of the same law, by Law no 12,349 of December 15, 2010, which radically changed the legal and operational framework of public tenders in Brazil, obliging all entities of the Federation to promote sustainable public tenders [2,5,6].

The goal of reducing costs and streamlining routines and procedures in procurement and hiring has been a priority in the Brazilian federal administration [4]. The introduction of new tools, provided by computer technologies, alongside the review of legislation and standards, has already made significant progress. After the implementation of electronic procurement, new

possibilities were opened for greater transparency, expansion of opportunities for participation and competition, and dissemination of management control mechanisms [1-3,7].

For purposes of guiding the legal and administrative aspects of the procurement of hospital materials, purpose of this study, we sought support in Law 10,520/2002, which created the bidding modality, and in Decree No. 5,450/2005, which regulated electronic procurement [5]. It is important to emphasize that the bidding modality, although doctrine and jurisprudence of the Federal Court of Auditors do not state anything on the matter, allows the managers to include a clause of demand of sample or prototypes from the bidder, provisionally, in the announcements, allowing for testing by the professionals who will use them.

The guiding question for this research is: How can the purchased through electronic bids of hospital materials be focused on improving the quality of products and impacting the safety of patients and health teams?

Considering the need to improve the purchasing processes through electronic procurement, providing improvements in the quality of health care provided to patients, the objective of this study was to propose strategies for the electronic procurement of materials in university hospitals to be a process focused on the quality of the products purchased, impacting the safety of patients and health care teams.

Methods

This is a descriptive study, with a qualitative approach, held in the period from September to December 2015, with managers of hospitalization units of the Gafreé and Guinle University Hospital of the Federal University of the State of Rio de Janeiro - UNIRIO, a large unit of the federal education network, located in the City of Rio de Janeiro/RJ/Brazil, based on the guidelines of the National Sustainable Procurement Policy [8].

A total of 18 nurses and 11 physicians participated in the management of medium and high complexity hospitalization units, intensive care, clinical, surgical and intensive care units, whose functions involve solicitation, evaluation and use of hospital materials. All duly invited to participate in the study, based on the details of their Free and Informed Consent Form.

Inclusion criteria

To be the manager of the hospitalization unit of Gafreé and Guinle University Hospital, to be responsible for the process of purchase and request of hospital materials, used in the therapeutic procedures performed with the patients of the unit, to agree to participate and sign the informed consent form.

The development of the study met the national and international standards of ethics in research involving humans and animals, according to CAAE opinion n° 47784415.8.0000.5285, approved on 27/08/2015, issued by CEP UNIRIO.

Characterization of the sample

Sixteen female managers (55.17%) and 13 male managers (44.83%) participated in the study. The participants' ages ranged from 31 to 70 years of age, with a mean of 47.72 years of age. The time since graduation ranged from 8 to 40 years, with an average of 24.38 years, while the time of experience in the sector averaged 14.54 years. As for the professional relationship, there were 24 (82.76%) in health care professionals and 5 (17.24%) faculty and health care professionals.

Production of data

Occurred in the period from September to December 2015, through the individual interview survey technique, whose instrument was a semi-structured script, elaborated by the researchers. The interviews were scheduled in advance, trying to reconcile the commitments of the participants and the researchers, being carried out in the hospital, in an exclusive environment, as a preventive measure to eventual interruptions.

The interviews were recorded in audio and later transcribed into Word. The interview script sought to answer the following question:

1. Which procedure material presents the most problem (in terms of quality) in the sector where you work?
2. Has there been any intercurrent in the procedure, because of the quality of some material?
3. Do you believe that the request for samples of hospital products in the electronic bids can contribute to the non-occurrence of these events?
4. Would the creation of a commission for the evaluation of samples in the electronic bids minimize material quality problems?

Method for analyzing the data produced

Content analysis was used, more precisely thematic analysis [9], considering its three stages: pre-analysis (floating reading and hypothesis formulation), material exploration (coding and classification in categories), treatment of the results obtained and interpretation (reflection process). The raw text was decoded into categories of thematic analysis on how managers understand the dynamics of procurement and bidding processes for hospital materials through electronic procurement, with emphasis on quality and safety control of patients hospitalized in the institution.

The categories analysis was based on the basic principles of Law 8,666/93, using the benefits of new information technology (IT), as a way to propose mechanisms to control the quality of materials purchased through the electronic procurement processes of the Gafreé and Guinle University Hospital.

In order to preserve the anonymity of the participants in the cuts presented in the categories, it was decided to use the following scheme: [Occupation and order number], considering legends NUR. (nurse 1-18), PHY. (physician 1-11).

Results

The raw data was organized into recording units from the themes that make up the four charts below, as a form of organization for the definition of the categories of the study.

Chart I - Materials that present more problems, University Hospital, Rio de Janeiro, 2015.

Order	Recording units
1	Intravascular catheter: (NUR1, NUR2, NUR3, NUR4, NUR8, NUR11, NUR16, PHY10).
2	Gloves: (NUR1, NUR5, NUR10,0, NUR12, NUR18).
3	Infusion set: (NUR10, NUR11, NUR13).
4	Y-type catheter extension set: NUR9, NUR10, NUR11).
5	Deep venous puncture catheter: (NUR13, PHY3).
6	Needles: (NUR10, PHY5).
7	None: (NUR14, PHY4, PHY9).

Source: Participants of this study, interview data.

Chart II - *Intercurrences with materials due to lack of quality, University Hospital, Rio de Janeiro, 2015.*

Order	Recording units
1	[...] in the case of intravascular catheter, which is the short intravenous catheter, it even caused the tearing of the patient's skin (NUR3).
2	[...] there was this issue of intravascular catheter [...] since it is of poor quality, you need to puncture the baby more often [...] which ends up causing more stress, both to the child and to the team [...] you end up extinguishing all venous access because of a bad material [...] in the end you have to call the surgeon because you just cannot do it (NUR 2).
3	[...] you do not know how the catheter is, you put the catheter there and then there is the mandrel, which is the guide. Then we take the guide out and leave only the flexible part there. [...] All because the material is not of good quality (NUR 4).
4	[...] especially intravascular catheter, which tears the skin of the person [...] the tip of the intravascular catheter that does not penetrate, causing pain [...] it is very bad for both the professional who is performing and for the person who is receiving care. [...] (NUR 8).
5	[...] we had to stop the transfusion and it could not be completed due to the quality (PHY 1).
6	[...] sometimes we do the procedure, and then on the next day or shortly afterwards, a new procedure has to be performed on the patient and this ends up exposing the patient to the risks inherent to the procedure (PHY 3).
7	[...] we had to interrupt surgeries because the double catheter J was not able to run on the hydrophilic guidewire [...] quality is a very important factor for the success of the surgical procedure and to decrease hospitalization (PHY 7).

Source: Participants of this study, interview data.

Chart III - *Efficacy of the sample request for the electronic procurement process, University Hospital, Rio de Janeiro, 2015.*

Order	Recording units
1	Often the sample is insufficient, or sample delays and they are usually always low quality materials (NUR2).
2	I already had some requests for samples and the need was met (NUR3).
3	It is not effective because in fact, the time you have to test is very short and the amount of sample sent is a very small (NUR10).
4	[...] if we do not have a standardization, I think it's the best way for us to get good material (NUR16).
5	I believe it helps, but it is necessary to set up a commission made up of people qualified to carry out tests, even if there is help of the heads of each department (PHY1).
6	Because this gives a possibility for the people who will use the material inside the surgical center or in the department, to assess if it meets the needs (PHY7).
7	Because then I can check the quality of the material before I spend [...] when we set up a bidding process we choose the cheapest material. We also need to have quality, not just price (PHY10).

Source: Participants of this study, interview data.

Chart IV - *The creation of a Standardization Commission minimizes problems in the quality of hospital materials, University Hospital, Rio de Janeiro, 2015.*

Order	Recording units
1	Yes (NUR5); Certainly (NUR4); I believe so (NUR7); Yes, I think it's essential (NUR16) ;It would be very important, it would be ideal (NUR17).
2	Both in relation to the material already purchased <i>and</i> to the material the commission requests technical opinions of (NUR1).
3	Certainly! Because you are following an entire protocol of a commission evaluating. You will certainly have... you will acquire better products (NUR2).
4	I believe that, yes, a standardization commission would be efficient in this sense, it would put certain standards in order to acquire good quality materials (NUR8).
5	I believe, as long as the committee is working as long as the people are on the committee, they have a commitment to the job, a knowledge of what they are doing in the end (PHY2).
6	Well, if this does not solve the issue, I have an impression that it would help a lot, because at least we would have the opportunity to evaluate the material before the purchase (PHY3).
7	Whether this will solve the issue or not, I don't know, but nonetheless, it is important (PHY4).
8	[...] I cannot say yes, this would solve it, but it would certainly be an important step if it were combined with the presentations of the materials to be used (PHY7)
9	I do not know if this is feasible, I do not know if this is already done, in fact [...] I have no management experience, I have experience with the sick (PHY10).

Source: Participants of this study, interview data.

The analysis of the Recording Units presented in Charts I, II, III and IV enabled the following thematic categories to emerge: 1) Materials with more problems, interurrences due to lack of quality criteria; 2) Credibility for requesting samples for electronic procurement; and 3) Purposes of the hospital materials standardization commission.

Discussion

Category 1 - Materials with more problems: interurrences due to lack of quality criteria

As can be observed in Table I, the participants of this study report that the materials that present the most problems are: intravascular catheters, gloves, infusion set, y-type catheter extension set, deep venous puncture catheters and needles, in addition to the information that no material presents problems, such as reports from NUR14, PHY4, PHY9.

According to a study carried out in 2012, in hospitals throughout the Brazilian territory, aiming to identify the activities of nurse managers of material and sterilization centers, using the Google Docs Offline® tool, the incorporation of sophisticated technologies for the acquisition of materials can help in the aspect of speed, however, it lacks criteria of quality of the products. Selective criteria to account for the complexity of hospital care practices, which allow the monitoring of product quality, preserving safety for the patient and health team [10].

The need to establish criteria for quality control of hospital materials has worried researchers around the world. Studies conducted in the United States of America [11], in England [12], in Iran [13], and in Canada [14], confirm that the technological advances of the industry must be carefully evaluated before being used in the therapeutic procedures carried out in health institutions.

As seen in the reports of the participants of this study, the invasive procedures carried out in hospitalization units require that the materials used in them be of reliable quality, be tested before being acquired. In case of perforation of the glove, the transfer of microorganisms and other pathogens is facilitated, increasing the risk of contamination of the surgical site capable of triggering nosocomial infection [15].

It is known that the occurrence of incidents that compromise patient safety has become a pressing challenge for all health care institutions, and may or may not involve injury. When they occur, they are called adverse events [14]. The issue of patient safety has become more and more widespread within health institutions and among health professionals with regard to

the constant pursuit of the quality of care provided and to minimize the number of preventable incidents [16].

The recording units listed in Table II provide a reading of the participants' reports, justifying their evaluations with important emphasis on the lack of quality of the materials, such as reports attributed to the poor quality of the intravascular catheters: as reported by participants NUR3 and NUR8 . It is also important to point out the suffering, stress and anxiety [11,12], due to invasive procedures performed several times [13] in patients in general, as reported by PHY3, or those imposed on the newborn, as reported by NUR2.

The issue of patient safety is intrinsically related to quality in health services and has been widely discussed by the health service providers, the class entities and government agencies [16-18].

Lack of criteria for evaluating the quality of products purchased through bidding has caused problems for the safety of hospitals. An important peculiarity of the electronic procurement process is the so-called inversion of the qualification and judgment stages, the former being understood as the one in which the bidder must prove his technical and financial capacity, as well as his fiscal suitability, to provide the good or service that the Administration wishes to acquire. The second refers to the effective calculation of the most advantageous commercial proposal for the Administration [19].

Likewise, according to Table II, the participants of this study attribute a low quality problem of the materials used for high complexity procedures, such as deep venous puncture catheters and infusion set used for infusion of large liquid volumes, hemotransfusions and various medications, such as reported by participants PHY1 and PHY7.

Among the intrinsic health care risks, infusion of medicines is a constant concern. Technological advances in the hospital equipment industry enabled the use of intravenous drugs through infusion pumps. Any programming error in an infusion pump can have serious consequences and can be fatal depending on the patient's profile or the medication used [20].

It is believed that for the establishment and maintenance of patient safety in intravenous therapy in intensive care units it is necessary to invest more in research with higher levels of evidence, since these provide a greater recommendation for practice [21,22].

About 80% of hospitalized patients receive infusion therapy. With the increased use of intravenous therapies, it became necessary to develop devices to infuse drugs with pressure higher than blood pressure and with high precision. About 30% of the damages during hospitalization are related to medication errors, which also have serious economic consequences for hospitals. The annual cost of severe damage to medication errors in the USA has been estimated at around USD 76.6 billion [20].

Adverse events are commonly associated with individual human error, but the working conditions, structural aspects and complexity of the activities developed should be considered as triggers [18].

Category 2: Credibility for requesting samples for electronic procurement

With the regulation of electronic trading, as approved by Decree No. 5,450/2005, bids for the acquisition of common goods and services, including contracting of continuous services within the Federal scope, are preferably made by this tool [22]. The absence of criteria for the supplier to provide sufficient samples of the materials for evaluation by the team that will use them, made electronic procurement limited to purchases with faster and quoted prices at the lowest price, compromising principles of safety and quality of hospital materials, purpose of this study.

Guarantees of faster and simpler stages of the bidding, with the reversal of phases and faster deliveries [19], are not sufficient for the electronic procurement to fulfill basic quality requirements in hospital materials purchasing processes. Nor did sporadic experiences of one or other team member consolidate critical behavior about the importance of sample requesting as an institutional policy, as observed in the information provided by the participants of this study.

Some nurses participants reported that the samples offered were insufficient for testing, therefore, they did not believe in the effectiveness of the sample request, as shown in Table III, according to NUR2 and NUR10.

When the supplier does not offer enough samples, there is a risk of serious accidents with patients and staff members. Incidentally, patient safety is defined as the reduction to an acceptable minimum of the risk of unnecessary harm associated with health care. The

acceptable minimum refers to current scientific knowledge, available discoveries, and the context in which care is provided [21].

Therefore, in addition to the creation of a commission for requesting samples in electronic procurement sessions, the participants of this study recommended that it be composed of professionals qualified to evaluate the quality of the materials that will be used in the therapeutic procedures developed in hospitalized patients.

Among the participants who favored the effectiveness of the request for samples in electronic procurement, it was stressed that the commission should be composed of qualified professionals who are involved with the use of the materials, as reported by PHY1 and PHY7, observed in Table III.

Category 3: Purposes of the standardization commission for hospital materials

Experiences with purchasing processes of hospital materials that include criteria for sample evaluation are decisive for managers to believe that their implementation is fundamental to the control of product quality. It is worth emphasizing the importance of the professional's preparation to act according to the recommended practices, so that they become able to act correctly in face of the recommendations and thus favor the safety of the patient [21].

A study carried out in a university hospital in the City of Ribeirão Preto, São Paulo, Brazil, reiterates the purchasing function, which encompasses all the essential activities associated with the acquisition of materials, services and equipment used in the therapeutic procedures performed at the institution, seeking to reconcile quality requirements and the standardization of the items of higher consumption in the hospitalization units [7].

According to the recording units in Table IV, participants in this study reported that they believe that the creation of a Standardization Commission would resolve the issues with the quality of hospital materials, such as NUR4, NUR5, NUR7, NUR16 and NUR1 reported. There were also those who favored it with reservations, such as PHY4 and PHY7 reported.

The insertion and attempted unification of patient safety content is still a recent proposition in Brazilian schools and is not part of school objectives. It demonstrates the necessity of a revision of the Pedagogical Projects, in which an interdisciplinary as well as transdisciplinary approach is contemplated, since there are continuous changes in the contemporary society, and the university must be ahead of these discussions [23].

It is important to note that in the recording units of Table IV, some reports from the participants point out that the creation of the commission can contribute to the improvement of the quality of materials, as observed in the statements of NUR1 and NUR8.

A study carried out in a medium-sized university hospital in Belém, State of Pará, Brazil, in 2014, suggests that the nurses' performance in the management of material resources is one of the greatest achievements in Managerial decisions, which reinforces their importance in the technical and administrative aspects inherent to care and management processes [24].

Finally, it should be pointed out that the administration of hospital institutions maintained with public funds is an immense challenge for managers, considering aspects such as low financing, imbalance between supply and demand, high costs and inefficient public policies and planning [7].

Conclusion

The study points the exposure of patients and professional staff caused by the poor quality of hospital materials purchased through the electronic procurement process, considering the lack of criteria for prior evaluation of the products, which could be minimized with the implementation of a commission for testing materials to be purchased in this process.

The occurrence of problems arising from the use of non-compliant hospital materials causes pain and suffering for hospitalized patients in the various departments of the hospital, as well as the stress and risk of accidents to the professionals of the therapeutic staff. These are reasons that justify the statements of the participants of this study when they affirm the need for standardization of these materials and their testing before the procurement processes, carried out through electronic procurement.

In view of the technological advances that electronic products have brought to hospital procurement processes, it is important to consider that speed without evaluation criteria for therapeutic purpose products increases the occurrence of non-compliance, the discarding of various products and waste of financial resources which could be better used in academic research in the university community.

This study does not exhaust the theme but opens up horizons for other academic institutions to discover new possibilities in the area of administration of procurement of hospital materials.

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