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CENTRALIZED GRAPHIC PRODUCTION AS A COST REDUCTION STRATEGY IN THE HEALTHCARE SECTOR

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Abstract: The production of printed materials and visual communication should always be the initial concern in hospital design, especially since it involves people in situations of high nervousness and stress. These items are relevant in healthcare institutions, even in a context of increasing digitization, as labels, forms, signs, and supporting documents are still essential for organizing care flows and ensuring the correct identification of patients and procedures. The main challenge is not the existence of these materials, but the fragmented/scattered way in which they are often produced. Different sectors create subjective solutions or hire different suppliers, generating multiple versions of the same document, with inconsistent/variable visual standards and opaque costs. This lack of care, although often ignored, over time leads to a lack of standards, the maintenance of documents that are no longer necessary, rework, outdated documents, and many difficulties in controlling and understanding, with both financial and operational impacts. Centralizing graphic production is a solution that creates an orderly and organized path for the creation, updating, discontinuation, and reproduction of these items, integrating this activity into institutional management and allowing for monitoring of the entire useful life of documents, identification of redundancies (unnecessary, unlike protocols where it is vital), and better understanding of expenses. In addition, the standardization resulting from this model combats internal differences between departments, minimizes the need for successive and subjective recreations, and lends credibility to the information, a very relevant aspect in care and reception environments, where clarity and uniformity contribute to the safety and reliability of processes. Concentration tends to generate benefits that go beyond simple direct financial savings, promoting greater productivity, version control, and reduced rework, as seen in national written production. Instead of ignoring graphic production, allowing it to be a scattered and operational activity, it should be incorporated into a structured flow. Institutions expand their capacity for financial predictability, organizational control, and maintenance of the quality of information used in healthcare.

Keywords: cost management; standardization; managed printing; patient safety; traceability.

Introduction

In healthcare organizations, part of what is lost comes not only from the cost of each item, especially high-value items, but also from the way operational routines are organized: repeated sectoral decision-making that could have been designed, unplanned emergency purchases, rework, and the coexistence of conflicting versions of documents. Graphic production fits well into this picture. It is present in virtually all flows (from outpatient care to the laboratory, from the pharmacy to hospitalization, from billing to communication with the patient) and, because it is present in all these environments, it is often scattered across sectors, contracts, and small decision-making centers.

In reality, the fragmentation of printing and graphic design tends to produce some undesirable effects: (a) printing equipment without institutional standards (multiple brands and models, different supplies and maintenance), (b) uncontrolled consumption (no visibility by unit and

type of item), (c) rework and emergencies (reprinting, correction, disposal due to obsolescence). This conflicts with the logic advocated by the Ministry of Health, which positions cost management as a tool for improving management and the use of resources in the SUS (BRAZIL, 2013).

At the same time, in the health sector, part of graphic production is directly associated with healthcare risk. Drug labeling, patient identification, sample labels, and visual alerts are not "administrative details": they are components of safety barriers. The National Health Surveillance Agency establishes actions for patient safety in health services through RDC No. 36/2013, reinforcing the need for organizational structures and processes that support quality and safety (ANVISA, 2013).

Given this, this article works with the hypothesis that centralized graphic production (internal or outsourced) is a managed model that can reduce total costs and decrease variability by establishing governance of document catalogs and other productions, version control, and criteria for compliance with national and international standards. The "national and international" aspect is important because multi-unit networks, especially those operating with certifications or global supply chains, need a homogeneous vocabulary: accessibility, safety symbols, labeling, and traceability.

Methodology

A qualitative, theoretical-applied approach was adopted, with a review of the literature and documentation. The sources were organized into: cost management in the public health sector; hospital standardization and governance; rationalization of the printing park; patient safety, labeling, and identification; accessibility and wayfinding; and applicable international standards (quality, symbology, and symbols in medical products, as well as traceability/coding guidelines). The analysis was performed by category, seeking convergence between regulatory requirements and operational implications. As a result, a method with governance, stages, and indices is proposed, discussing the benefits and risks of implementation.

Theoretical Framework

Graphic production in healthcare as operational infrastructure

Graphic production in healthcare can be divided as follows:

- care printing (identification, labeling, checks, and records),
- administrative printed materials (requests, forms, internal protocols),
- patient communication (brochures, guidelines, and educational materials), and
- guidance and safety systems (signs, pictograms, routes, and warnings).

In networks with many units, there is a multiplication in volume and risk: the more units, the greater the risk of "local" versions and adaptations of the same item coexisting.

This point is very important because it shifts the discussion from "printing more cheaply" to "organizing a service." The cost, in this case, is not only in paper and toner: it is also in the time spent by teams, in rework, and in the difficulty of proving

compliance when there is an audit or incident investigation.

Cost management and total cost of ownership (TCO)

The publication Introduction to Health Cost Management, by the Ministry of Health, emphasizes cost management as a support for decision-making and the pursuit of efficiency in the use of public resources, based on cost accounting concepts and the implementation of cost systems in public health organizations (BRAZIL, 2013).

Applied to graphic production, this angle suggests that looking at TCO, in addition to the direct cost of inputs and contracts, includes maintenance and support, internal distribution logistics, emergency costs, losses due to obsolescence and disposal, rework expenses (reprints, corrections, versions), and indirect costs related to communication failures and non-compliance. Concentration acts as a control tool, allowing the measurement of the unit cost per set of parts and tracking where the need is being created and why.

Standardization and governance: from "each sector does its own thing" to an institutional catalog

Today, existing academic production on hospital standardization clearly focuses on clinical materials and supplies, but it offers important lessons on what we emphasize here. The discussion on standardization processes and flows in some university hospitals in our country (Brazil) shows that the architecture of the process and the clarity of responsibilities are essential to sustain rationalization and consistency (NAPOLEÃO FILHO et al, 2014).

Standardization can be divided as follows: Content (minimum fields, clear texts, standardized warnings, periodic reviews); Visual (legibility, hierarchy, contrast, pictograms, and colors); Data (codes and identifiers that can be integrated into systems (e.g., barcodes and QR codes).

The existence of a "catalog" as an institutional standard reduces local reinvention and facilitates auditing. The gain is more than aesthetic: it is operational.

Centralization and execution models (internal, outsourced, or hybrid)

Brazilian studies on printing park optimization indicate how dispersion and heterogeneity cause consumption to skyrocket and make control difficult. In a case study by the Federal University of Santa Maria, the adoption of "printing islands" is shown as a rationalization practice; the dissertation records, for example, a significant reduction in toner consumption in the analyzed unit (pre-island versus post-island), illustrating the potential savings associated with standardization and control (BORTOLIN, 2015).

In the field of outsourcing, the article on outsourcing (a type of strategic outsourcing) of printing at the Federal University of Santa Catarina discusses the model as a good tool and formalized management solution through contracting, with the aim of reducing costs and improving efficiency by standardizing the service and allowing focus on core activities (NAPOLEÃO FILHO et al, 2014).

For healthcare organizations, the practical conclusion is that centralization does not necessarily mean outsourcing. It me-

ans consolidating governance, metrics, and standards into a service with predictability and sustainability. This can be internal, outsourced, or hybrid; the main thing is that the model encompasses content management and version control, not just equipment management.

Patient safety, labeling, and traceability

Patient safety is paramount to centralization and the effort to standardize operational processes. RDC No. 36/2013 establishes actions for patient safety in healthcare services, reinforcing the need for organizational structures and systematic processes (ANVISA, 2013).

The documents circulating in the health unit also explain the link between labels/packaging and errors. ISMP Brazil highlights that labeling, packaging, and nomenclature influence the system of medication use and can cause errors and harm, offering recommendations for risk prevention and mitigation and safeguarding lives (ISMP BRASIL, 2026).

In hospital pharmacies, due to high demand, the use of barcode or QR Code technologies can detect potential errors in the distribution process, contributing to risk prevention and reducing costs associated with failures (JAYME; CARNEIRO, 2016).

In the specific field of labeling, RDC No. 71/2009 establishes guidelines for drug labeling, focusing on improving the form and content of labels, highlighting that labeling is a regulatory issue and not just a matter of design (ANVISA, 2009).

Finally, traceability and identification standards, such as GS1 guidelines for implementing AIDC standards in healthcare, reinforce the importance of interoperable coding to reduce errors and improve flow reliability (GS1, 2015). These precautions and knowledge should be part of the routine of everyone involved in healthcare at the facility.

Accessibility and signage: national standard and international convergence

Graphic standardization also includes signage and guidance inside, at the entrance, and exit of the healthcare facility. This care becomes even more relevant because these are buildings where users tend to have above-normal stress levels, often compromising their cognitive abilities. In Brazil, ABNT NBR 9050 (accessibility) establishes technical criteria and parameters for the design and adaptation of environments, which unfolds in visual and informational communication requirements (contrast, legibility, signage, and safe use) (ABNT, 2020).

Internationally, the International Organization for Standardization has standards that support common visual language. ISO 7010 prescribes safety signs aimed at accident prevention, fire protection, health risks, and emergency evacuation, based on design principles and colors from related standards (ISO, 2019).

ISO 15223-1 standardizes symbols used to express information provided for medical devices, applicable globally and relevant for symbolic consistency in environments where different regulatory requirements coexist (ISO, 2021).

These references are useful for multi-unit networks because they avoid local "dialects": symbols, colors, and messages remain

consistent, reducing confusion and improving navigation and safety.

Discussion

Proposed model: Standardized Centralized Graphic Production (PGC-P)

Model principles: PGC-P views graphic production as a quality process, with document lifecycle and audit trails. ISO 9001 is fundamental to justifying this approach: it defines requirements for establishing, implementing, maintaining, and continuously improving a process-based quality management system (ISO, 2015).

Governance (who decides, who validates, who executes)

The simplest possible form of governance is proposed in hubs: Technical hub for graphic production (catalog management, information design, visual standardization, costs, and indicators); areas of direct care such as pharmacy, nursing, laboratory (validation of critical items); compliance (protocols and internal audits); IT and supplies (integration with systems, secure printing, and supplier management).

The main governance rule is simple: no critical item enters production without a controlled version and technical validation.

Operational flow

For the desert traveler, knowing the destination and being sure of the route he is following saves him steps and fatigue. The same principle applies to hospital management: understanding the minimum and most efficient path saves resources, reduces emergencies, and rework. We propose:

1. Structured request (classification by criticality);
2. Screening (already in the catalog? Is it a revision? Is it a new item?);
3. Production/updating in an official model;
4. Validation (care/regulatory, according to criticality);
5. Publication of the version and blocking of old versions;
6. Production (internal center/supplier);
7. Distribution and controlled disposal;
8. Audit and improvement (incidents, rework, consumption).

Points of attention:

Template library and corporate catalog separated by family (labels, forms, signage, educational materials), with visual and content rules, mandatory fields, and metadata (version, validity, applicable unit).National and international standardization rules with a map of equivalencies between Brazilian requirements (e.g., accessibility, labeling) and international references (safety signs, device symbols, quality), making explicit "what is mandatory" and "what is recommended." Execution and capacity (internal/outsourced/hybrid), the contract (if any) must be formal, contingency plan, quality audit, and secure printing support. Internal execution must provide for minimum redundancy to avoid a single point of failure. Information security and traceability for sensitive items (personal data, identification), controlled

release printing and user accounts are recommended; for critical care items, readability and code reading compatibility tests are recommended where applicable (JAYME; CARNEIRO, 2016).

Recommended indicators (KPIs)

- Unit cost per item family (labels, forms, signage, education);
- TCO of the printing ecosystem (contracts + supplies + maintenance + rework);
- Lead time by criticality;
- Reprint/rework rate (by cause and per unit);
- Catalog compliance (% of parts issued with current template);
- Incidents related to labeling/identification and corrective actions;
- Obsolescence and disposal (quantity and estimated cost).

Where savings "appear" in practice,

Rationalization by printing islands suggests that savings do not depend solely on purchasing cheaper supplies, but on reducing dispersion, standardizing, and controlling consumption (BORTOLIN, 2015).

In outsourcing, the benefit often described is the predictability and standardization of the service (equipment, maintenance, and rules of use), supporting management and focus on core activities (NAPOLEÃO FILHO et al, 2014).

In healthcare networks, this translates into fewer emergencies, fewer one-off purchases, fewer "parallel updates" to forms, and less inventory obsolescence. There are also economies of scale on non-critical items (e.g., educational and institutional materials), without losing version control.

Final considerations

Graphic production, although often seen as a minor expense, supports critical healthcare processes and can become a significant source of waste when treated as a fragmented activity. The centralization proposed in this article is not limited to purchasing printing services: it reorganizes governance, creates a catalog, controls versions, and converts regulatory standards into operational templates.

Based on Brazilian references for cost management, patient safety regulatory documents, and evidence on labeling and traceability (including barcodes), it was argued that centralization tends to reduce TCO and variability, with economic and healthcare benefits.

For future research in this area, empirical "before/after" validation in multi-unit networks is recommended, measuring costs, rework, obsolescence, and incidents related to labeling/identification, comparing internal, outsourced, and hybrid arrangements.

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