Information design considerations in graphic artifacts of the diet prescription process: On the information flow in a public university hospital

Considerações sobre o design da informação em artefatos gráficos do processo de prescrição de dietas: um estudo do fluxo de informações em um hospital público universitário

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Problems with manual recording of information in graphic artifacts in hospitals can compromise the effectiveness of the nutrition care process (NCP), harming the diet of patients. This article mapped the information flow of the NCP focusing on graphic artifacts, as a sign of problems that may interfere with the quality of hospital nutrition services. To this end, a case study was carried out at the HC/UFPR to identify potential problems in the graphic configuration of hand-filled artifacts that may make it difficult to record and read information. The results showed that documents produced by digital and printed systems have the addition of information by hand, have deficiencies in their graphic configuration, and the problems caused by handwriting when filling in forms can compromise the continuity of the flow of information and, consequently, the activities required for the nutritional care of the patient. It can be concluded that the principles and concepts of information design can collaborate with the organization and representation of information in graphic artifacts of the NCP in hospitals, and thus help the flow of information.

Problemas de registro à mão de informações em artefatos gráficos em hospitais podem comprometer a eficácia do processo de cuidados nutricionais (NCP), prejudicando a dieta de pacientes. Este artigo apresenta o mapeamento do fluxo de informações do NCP com foco nos artefatos gráficos, como sinalizador de problemas que venham a interferir na qualidade dos serviços de nutrição hospitalar. Para tal, foi realizado o estudo de caso do hospital HC/UFPR para identificar potenciais problemas de configuração gráfica dos artefatos preenchidos à mão que possam dificultar o registro e leitura de informações. Os resultados mostraram que documentos gerados em sistemas digitais e impressos têm o acréscimo de informações manuscritas, apresentam deficiências em sua configuração gráfica, e os problemas causados pela escrita à mão no preenchimento de formulários podem comprometer a continuidade do fluxo de informações e, por consequência, as atividades necessárias aos cuidados nutricionais do paciente. Conclui-se que os princípios e conceitos do design da informação podem colaborar na organização e representação de informações nos artefatos gráficos do NCP em hospitais e assim auxiliar o fluxo de informações.

1 Introduction

In health services provided by hospitals, the nutrition care process (NCP) occurs continuously, involving several health professionals, professionals in the production sector, patients, and their companions. This process begins with the nutritional assessment at the time of admission of the patient to the hospital and continues during their stay (Mowe et al., 2006). During the NCP, a series of information will allow the diets (oral and enteral) to be prescribed and forwarded by the physician to the nutrition sector, which directs to the production sector that, finally, delivers to patients. Oral hospital diets are those indicated for patients who have an "intact gastrointestinal tract, with conditions for ingestion, digestion and absorption of food" (Maculevicius & Dias, 2006, p. 465). On the other hand, the enteral diet is delivered by an enteral tube (Cederholm, 2017). The study reported herein focuses on oral feeding prescribed as a normal diet to adult patients, without distinction of gender and who do not have problems in gastrointestinal function.

In the prescribed oral feeding process, several documents participate in recording and disseminating of information in the flow of the nutrition care process (NCP), especially the Diet Prescription, Dietary Prescription and Diet Map. The Diet Prescription is the medical document, also referred to as the medical chart, with information on the specificity of the diet according to the patient's clinical conditions, the ability to chew and swallow, and the digestive and absorptive capacity (Borba, 2019). The Dietary Prescription, in turn, is a document prepared and supervised by the clinical nutritionist, which contains information regarding the total energy value, diet consistency, macro- and micronutrients, fractionation, among others (Brasil. Conselho Federal de Nutrição, 2018; Gonçalves, 2016). Finally, the Diet Map contains information on the types of diet prescribed in the therapeutic planning, in addition to the preparations requested, based on individual preferences or specific needs of patients. This map is sent to the kitchen maids for portioning, assembling and distributing meals (Pedroso et al., 2011). These, among other documents, function as mediators in the information flow necessary for nutrition care process (NCP). They support and define the actions carried out by health professionals at their various hierarchical levels. Therefore, the adequacy, access, clarity of information in the NCP aid the professionals in decision-making and problem solving during the process (Freitas et al., 1997).

In this scenario, it is noteworthy that NPC's documents are graphic artifacts[1] (e.g., forms, charts, labels, maps) that support recording, storing, viewing and retrieving the information necessary for the flow of the process. Thus, their purpose is to inform and guide professionals to record and access patient nutrition data for daily assignments and routines.

[1] This research adopts the definition of graphic artifacts as mediating supports for the registration, storage, visualization, and retrieval of information, based on the definition of artifacts presented by Ninin (2009, p. 353): "Artifacts are all the means that individuals have at their disposal to influence the object of the activity and transform it into a result. [...] They play the role of mediators between the elements of an activity."

However, the literature points out problems and failures that occur through the recording of information in graphic artifacts when filling in by hand (Fontenele et al., 2019; Quitério et al., 2016) that can hinder communication between professionals who participate in the NCP. This, consequently, can interfere with meeting the dietary needs of individuals in the recovery of health status, and thus prolonging hospital stay (Duchini et al., 2010; Ribas & Barbosa, 2018; Schenker, 2003).

Regarding the way of inserting information in the artifacts, some authors report problems arising from the lack of registration in the documentation and from the illegible handwritten filling, and which have erasures (Fontenele et al., 2019; Pena & Melleiro, 2017; Quitério et al., 2016). Other authors reflect the concerns related to the insertion of information by hand, within the scope of medical prescription. They assess and discuss problems caused by lack of legibility in physician handwritten prescriptions, such as treatment delays and inappropriate/incorrect prescriptions (Zhang et al., 2020). Problems, such as those mentioned, can result in additional health sequelae, such as adverse events, morbidity and mortality (Albarrak et al., 2014; Rosa et al., 2009; Zhang et al., 2020). It is noteworthy that, in addition to physicians, health professionals who make up the care team, such as pharmacists, physical therapists, nurses, can be affected by the reduced efficiency in their activities, due to the lack of legibility in the prescriptions filled by hand (Zhang et al., 2020). In this context, there is a possibility of applying the concepts and aspects of information design to facilitate registration and make the information clearer and more accurate, allowing the work of health professionals and the flow of information in the process to take place more fluidly.

In the field of health, the literature reports some issues related to the design of information in graphic artifacts. Study developed in by Noël et al. (2017) reports the interaction of health professionals with data on patient needs, viewed on boards, posted on walls, full of information. The authors highlight: "the amount of information presented, the way it is presented and the lack of hierarchy makes it difficult to know where to start reading. Where and how the data is displayed is also part of the visualization problem." (Noël et al., 2017, p. 106). Thus, it is possible to infer that the graphic configuration of artifacts, the mode and location of their display, can harm the registration, visualization and retrieval of information and, consequently, the activities and decision-making of health professionals.

In this context, this article describes a study on mapping the flow of information and artifacts involved in the NCP at a public hospital in the state of Paraná. The mapping results can be understood as signs of problems that may interfere with the quality of nutrition services provided to hospitalized patients. In the next topic, to contextualize the theme of this article, aspects of the information flow and information design guiding this study will be listed.

2 Information Flow and Information Design: Contributions to the Study of the NCP

In this article information is understood as "concatenated data that has undergone a transformation process, whose form and content are appropriate for a specific use", as defined by Audy et al. (2005, p. 94). These authors present the main characteristics of information that "determine its value for the organization or process under analysis", which are: accurate; complete; flexible; reliable; relevant; clear (simple); fast; certifiable; accessible and safe. Based on this, it is possible to select the characteristics of the information that participate in the NCP and that can be considered in the study of the flow of information focusing on graphic artifacts. Therefore, the following characteristics are considered in this article: accurate, complete, reliable, relevant and clear, which are shown in Table 1.

Table 1 Characteristics of information considered in the study on information flow focusing on graphic artifacts.

Accurate	No errors; in some cases, incorrect information is generated because incorrect data is entered as input to the transformation process.
Complete	Contains all relevant facts in the process under analysis.
Reliable	It is dependent on the reliability of the source data and the data collection methods.
Relevant	They are important for decision makers to decide on a particular process or decision.
Clear (simple)	It must be simple; must be filtered in quantities compatible with the needs and processing capabilities of the decision maker.

Source: Prepared by the authors, based on Audy, Andrade, & Cidral (2005).

Regarding the term 'information flow', this is understood as a series of tasks related to the creation, development, production and communication of a particular product, service or information, which permeate the organization, as defined by Machado and Toledo (2008). For these authors, mapping the flow of information enables knowledge and analysis about the environment, the professionals involved in the process, enabling the visualization of failures in activities that may compromise the organization's objectives. To assist in visualizing mappings, the flowchart is the main tool for representing the path of information through a graphic sequence of actions that make up a work or process (Oliveira, 2002). Therefore, in the study of graphic artifacts of the NCP, the importance of identifying the steps of the process is highlighted, as well as the sources involved, the people who affect each step, the possible problems arising from these, and the way

in which an institution captures, distributes and uses information and knowledge (Davenport, 1998).

Based on these considerations, mapping the information flow of the NCP at hospitals makes it possible to locate problems related to the means and forms used to record information that may interfere with the conduct of the process, and consequently, result in the delivery of a meal that is not compatible with the patient's needs. Such aspects are discussed in this article, which, based on a flowchart of the NCP, focuses on how and when the handwritten record of information takes place, the artifacts involved and the possible consequences for the process. For this, aspects of information design relevant to the insertion of information by hand in graphic artifacts in the context of hospital nutrition are discussed below.

2.1 Information design and graphic artifacts to be filled by hand in the NCP

In the field of information design, studies investigate how informational artifacts are graphically structured, through the representation of information, the organization and relationship between graphic elements, in order to help readers to understand and deal with the artifact. Among these, Schriver (1997, p. 251) uses the name "structure the reader's visual field.", with the objective of knowing how typographic and spatial issues are used, "to see the hierarchy of the text, the relationship of the parts with the whole and the distinction between main ideas and details (whether on paper or online)".[2]

2 Ibid.

Thus, for the development of efficient graphic artifacts, the articulation of the visual field must consider: (a) the organization of information regarding typographic hierarchy, emphasis, similarity, proximity, sequentiality (Horn, 1998; Runne Pettersson, 2012; Schriver, 1997; Waarde, 2004); (b) the legibility of verbal elements (font, font genre, body size) (Dyson, 2004; Farias, 2004; Schriver, 1997; Waarde, 1999); and (c) spatial occupation in terms of the use of vertical and horizontal spaces (Schriver, 1997). The **typographic hierarchy** deals with an order of priority among the elements of a set, a sort of ascending or descending rank. **Emphasis** is related to highlighting, that is, groupings to assign emphasis. **Similarity** is relative to the similarity in the configuration of graphic elements that makes them look alike. **Proximity** refers to the relations of proximity or distance between graphic components, that is, the distance between them. Finally, **sequentiality** is associated with the relationship between graphic components, which can represent the sequence of elements in information sections in graphic artifacts. Figure 1 illustrates examples of information organization.

In the examples of **similarity** and **proximity**, unfavorable situations are perceived. In the image that illustrates the similarity, the use of the same font, body text, in addition to the variation in
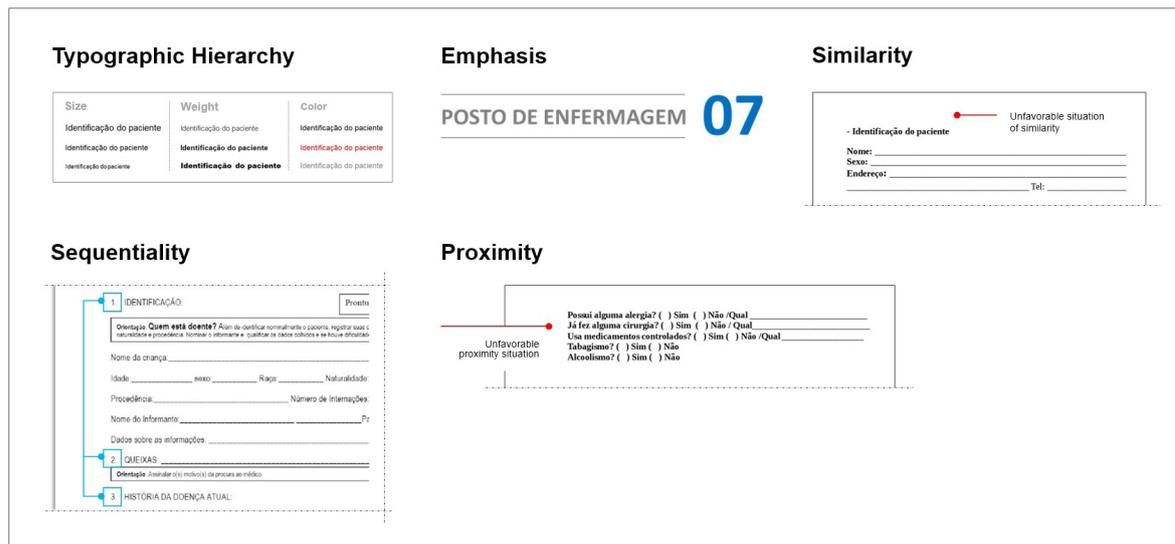
Figure 1 Examples of typographic hierarchy, emphasis, similarity, proximity and sequentiality.
Source: Prepared by the authors based on (Horn, 1998; Runne Pettersson, 2012; Schriver, 1997; Waarde, 2004).

bold, leveled the title and the text, that is, it did not assign a difference between the types of information. In the example of proximity, it appears that the little space between the lines and between the information can confuse the reader when filling in the information.

Spatial occupation regarding the use of vertical and horizontal spaces (Schriver, 1997) deals with the way in which verbal, pictorial and schematic graphic elements (Twyman, 1985) are related and promote the visual separation between the blocks of information. The objective is to generate interactive visual cues in order to contribute to the location and relationship between groups of information (Schriver, 1997). In this sense, interactive cues can help the reader to perceive certain groupings and, therefore, the hierarchy of the document. Thus, features such as vertical spaces, horizontal spaces, and spatial separation with chromatic changes can contribute to the creation of graphic artifacts with better organization of content sequences (Schriver, 1997). As an example, we have in Figure 2 the use of columns and displacement (vertical spaces), distance between title and blocks of information (horizontal spaces), as well as the chromatic change to distinguish and facilitate the location of spaces to be filled.

In the scope of the NCP, for the development of graphic artifacts that facilitate to fill in and read information, it is essential that the visual field design is effective, considering the organization of its elements, the textual readability and the occupation of the graphic space of the artifacts. Although the errors related to the lack of legibility in documents filled in by hand are considered worrying, so far no "standardized methods to ensure error-free prescriptions" have been found (Zhang et al., 2020, p. 42). In order to overcome problems like these in graphic artifacts of the NCP, it is important to analyze aspects that can establish identification, intensity and
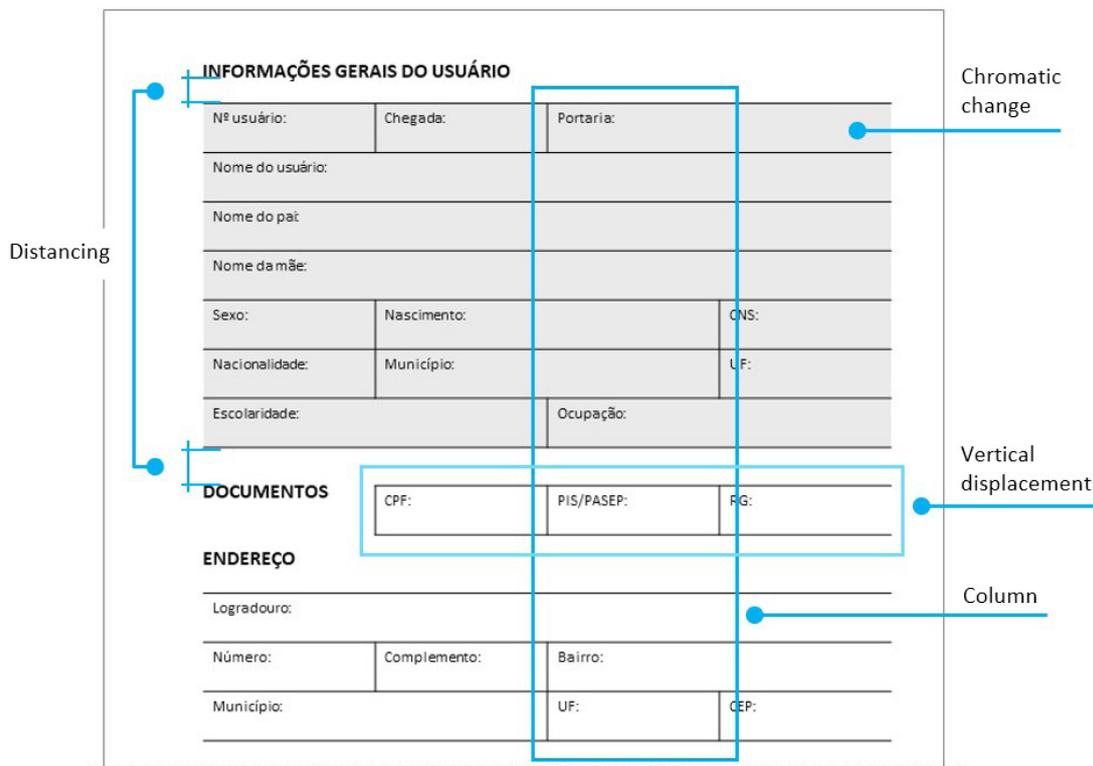
Figure 2 Vertical, horizontal spaces and use of color for the spatial organization of graphic elements.
Source: Prepared by the authors.

emphasis in the articulation of the visual field of verbal (e.g., words, letters), pictorial (e.g., images, symbols) and schematic (e.g., lines) of the artifacts. Studies on such aspects, from the point of view of information design, may help to solve problems related to the organization of information, distribution and groupings used in the graphic configuration of artifacts of the hospital nutrition care process.

Considering this, the results of a case study on the flow of information in the diet prescription process carried out at a public university hospital in the state of Paraná are presented below, with a focus on graphic artifacts to be filled in by hand in the NCP.

3 Case study at the 'Hospital das Clínicas' Complex – HC/UFPR

The case study at the 'Hospital das Clínicas' Complex of the Federal University of Paraná (HC/UFPR) in Curitiba was carried out with the aim of checking potential problems related to the graphic configuration of hand-filled graphic artifacts, which could make data recording difficult, and thus, interfere with the flow of information from the NCP. These possible problems can affect the quality of nutrition services provided to hospitalized patients. Thus, we sought to identify the following aspects:

- how information flows in the NCP for normal oral diets;
- which professionals participate in the process;
- which of these have decision-making power in the use of information;
- what means are used to record information; and
- which graphical artifacts into which information is entered by hand are used in the process.

3 The nutritionists contacted for the interview are key informants and directly participate in the prescription, production and distribution of meals for patients hospitalized in the ward of internal medicine: the head of the Clinical Nutrition Unit at the HC and the coordinator of the residency in nutrition and supervisor of contract of the outsourced production company. The nutritionists were informed about the research objectives, and upon agreeing to participate, they signed the Informed Consent. This research was approved by the Ethics Committee of the 'Hospital das Clínicas' Complex of UFPR, on April 10, 2021, with opinion number 4642037.

Data were collected through: (a) direct observation in loco with photographic record of graphic artifacts involved in the NCP, and (b) semi-structured interview with two nutritionists[3] who participate directly in the NCP at the HC/UFPR, in the ward of internal medicine.

Interviews were conducted with free time for responses, in the work environment of each professional, with prior appointment, between May and June 2021, with an average duration of one hour each meeting. Each participant was interviewed individually. Answers were recorded by audio and manually in the script by the interviewer. After recording the audios, the interviewer scheduled new meetings with the nutritionists to clarify doubts and check the data extracted from the audios. At the end, information was synthesized, described in tables, visually represented in a flowchart that maps the NCP, whose information was reviewed by the nutritionists. The information related to the presence of graphic artifacts in each stage and activity of the NCP are presented below.

3.1 Main results

Results on the mapping of circulating information in the NCP at the HC/UFPR, show where the records of information resources occur, which are the responsible sectors, the activities and available means of communication.

Information extracted from the interviews made it possible to generate a flowchart, described in the next topic, which includes:

- the steps and activities of the process;
- the professionals who participate in the process;
- the activities that each one performs;
- how the information is conveyed in the process; and
- which graphic artifacts participate as mediating supports for the registration, storage, visualization and retrieval of information.

Four stages of the NCP process were identified: (a) prescription, (b) production, (c) assembly, and (d) delivery/pickup. Professionals involved in these stages were physicians, clinical nutritionists, nurses, nursing technicians, production nutritionists, cooks, assistants, kitchen maids and nutrition assistants.

The information regarding the process is entered in two ways: (1) typed into a digital system, using two software (SIH and AGHI) specific to SUS and HC; (2) handwritten on graphic artifacts (forms and labels) printed in black on white paper and on the patient chart (made of wood and covered in Formica) fixed to the wall, located in the hallway of the ward of internal medicine. Graphic configurations of digital systems were not analyzed in this study, which focuses on printed graphic artifacts for filling by hand. However, the SIH System, where the diet maps are generated, was considered in printed form for analysis of informational elements.

Table 2 describes the attributions of each professional and highlights: those who have decision-making power in the face of the data (**in bold**), those who enter information in graphic artifacts (**in blue**), the way in which this information is entered and the stage of the process in which they participate.

As for the professionals involved, almost all (*N* = 7 of 8 professionals) enter handwritten information in the artifacts during the NCP. It is noticed that professionals who have decision-making power, physicians

Table 2 Professionals, attributions, decision-making power and insertion of information in the process.

(continued)

Professionals	Activities performed/insertion of information in the process	Process stage
PHYSICIAN	**Develops and updates the medical prescription of procedures, drugs and diets, prescribes a diet consistent with the disease**; Enter information into the system (typing).	Prescription
CLINICAL NUTRITIONIST	**Management of dietary prescription, visit to the patient to complement information, prepare the dietary prescription consistent with the disease, food restriction or preference**; **Determines the type of preparation and/or the particularities**; Enter information into the system (typing); **Enter information on labels (by hand)**.	Prescription Production Assembly Delivery and pickup
NURSE	Updates patient data (blood pressure, exams), enters information into the system (typing); If necessary, and requested by the physician, **can enter information on the diet map (by hand)**; **Enters information in the patient chart (by hand)**; Collects and discards leftovers from meals in the trash; **Notes the acceptance of the diet and possible complaints (by hand)**; Communicates to the kitchen maid or directly to the nutrition sector.	Prescription
NURSING TECHNICIAN	Collects and discards leftovers from meals in the trash; **Notes the acceptance of the diet and possible complaints (by hand)**; Communicates to the kitchen maid or directly to the nutrition sector.	Delivery and pickup
PRODUCTION NUTRITIONIST	**Management of production, assembly and distribution of meals**; **Enters information on labels (by hand)**.	Production Assembly

Table 2 Professionals, attributions, decision-making power and insertion of information in the process.

Professionals	Activities performed/insertion of information in the process	Process stage
COOK/ASSISTANT	Meal production, food labeling. **Enters information on labels (by hand)**.	Production Assembly
KITCHEN MAID	Meal labeling, separation of other items for each patient, meal assembly; **Records the number of meals delivered per shift (by hand)**; Delivery of meals; **Enters information on labels (by hand)**.	Production Assembly Delivery and pickup
NUTRITION ASSISTANT	Communication between the clinical nutritionist and production; **Enters information on labels (by hand)**.	Production Assembly

Source: Prepared by the authors.

and clinical nutritionists, are responsible for entering information about procedures and diets for the patient, both in the digital system and by hand in graphic artifacts. In addition to these professionals, others such as the kitchen maid, the nursing technician, the cook and the assistant also enter information into artifacts such as, for example, labels that identify the food and the particularities of each patient. Regardless of the professional training of these individuals, problems generated by entering information in handwritten form can confuse and make it difficult to compress the data (Fontenele et al., 2019; Quitério et al., 2016) and, therefore, lead to misguidedly conduct some activity during the process. Thus, depending on the professional's handwriting and the graphical presentation of the artifact, problems may occur during the recording of information.

Data extracted from the interviews were represented in a flowchart demonstrating each step of the process, described in detail in the next topic.

3.2 Flowchart of the NCP at the HC/UFPR

Based on the results extracted from the interviews, a NCP flowchart was prepared with the objective of mapping the actions of each stage, understanding the means of conducting the information used by the professionals involved, checking which resources (means/ artifacts) are applied, and with that, visualizing and identifying possible informational problems. The study of the process considers the beginning when the patient is referred to hospitalization from the outpatient clinic of the HC or other health units, and the end, when the meal is delivered to the patient, collected and verified by the clinical nutritionist regarding the acceptance of the diet.
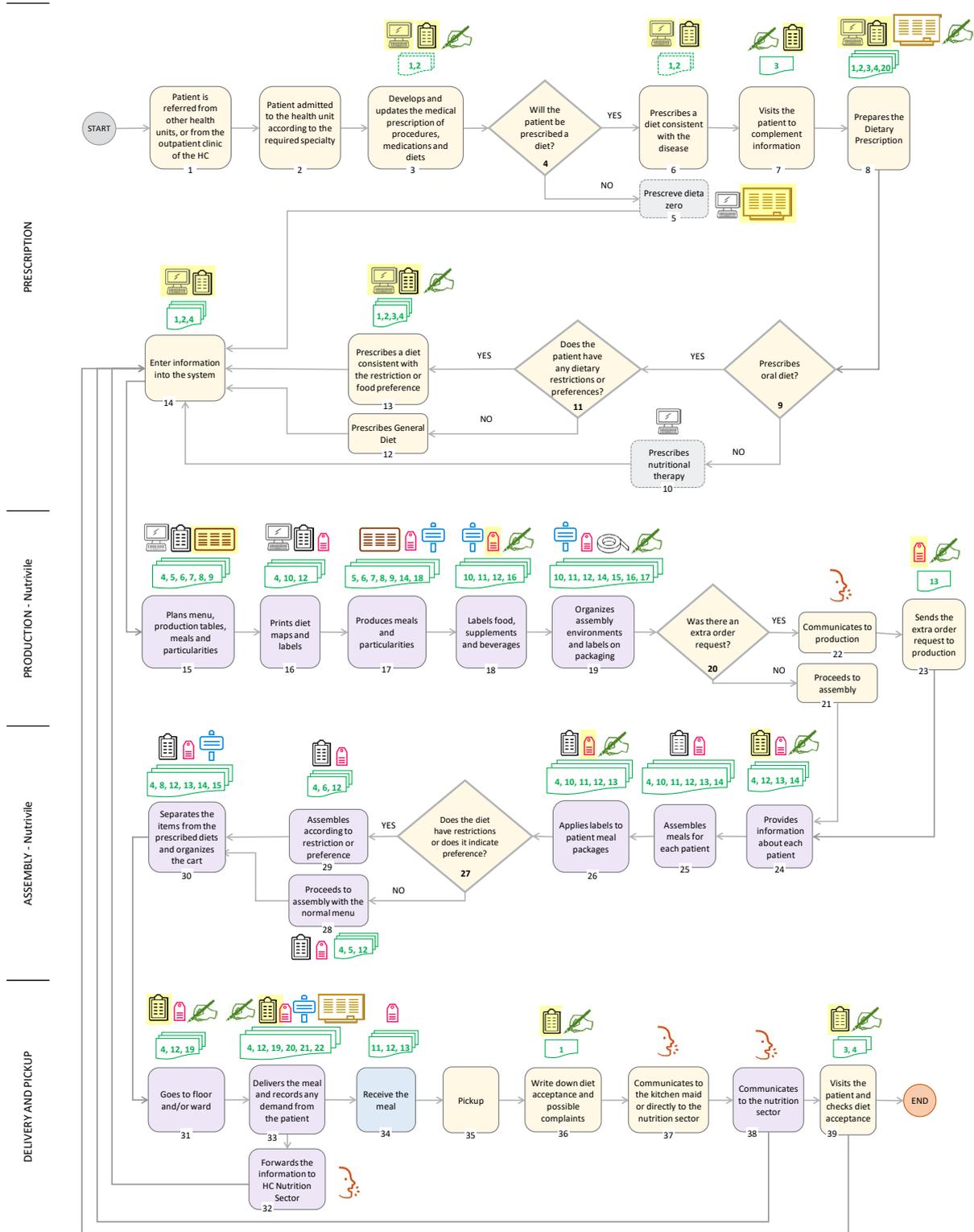
A total of 39 steps were identified in the NCP, and 23 graphic artifacts were used in the process as a support for registration and access to information, which are divided into five categories: digital system (*n* = 1), forms (*n* = 5), labels (*n* = 5), frames (*n* = 6) and boards (*n* = 6). However, nine artifacts used to record information by hand were considered as elements of analysis of the study, namely: forms (*n* = 4), labels (*n* = 4) and chart (*n* = 1).

Figure 3 illustrates the NCP flowchart of the HC/UFPR hospital, which is divided into four stages: prescription, production, assembly, delivery/collection (considered as a single stage). The 39 steps include activities (represented by rectangles) and decision moments (represented by diamonds). Activities in yellow are performed by professionals from the HC, while those in lilac are performed by professionals hired by the outsourced company that takes over the stages of production, assembly and delivery of meals to patients. Stages in gray with dotted outline (5, 10) refer to the zero-diet prescription and the prescription of nutritional therapy, which are not considered in this study.

Graphic artifacts are represented and located over the activities as icons (described in a table at the bottom of Figure 3). Just below the icons, the symbol to represent documents is in green. In this symbol there is a numerical indication of graphic artifacts that participate in each activity. The means of transmitting information, written by hand or by the oral verbal mode, are highlighted with their respective icons. Those artifacts in which information is recorded in handwritten form receive, on the side, the icon representing a hand holding a pencil. The moments in which the information is inserted in the artifacts and/or in the NCP systems are also marked in yellow.

The information entered by hand in graphic artifacts occurs in all stages and in 11 activities of the process (7, 8, 13, 18, 23, 24, 26, 31, 33, 36 and 39). Table 3 describes the activity, which artifact received the information, and which professional entered the information by hand. We can notice the diversity of professionals who add information to graphic artifacts, used in activities ranging from the elaboration of the dietary prescription, the assembly, to the delivery of the meal to the patient.

The use of handwriting to record information in artifacts is subjected to misunderstanding due to the lack of legibility in handwriting, allowing professionals to misinterpret the information during the process (Zhang et al., 2020). As a result, problems of interpretation can interfere with the daily and constant transformation of information, and thus, directly harm the work of those in charge during their activities. Therefore, these professionals can be unfairly accused of errors in the NCP, when in fact, the information resources make the work difficult, and can thus lead to many failures.

Figure 3 Flowchart of the PCN at HC focusing on graphic artifacts, and icon description table.
Source: Prepared by the authors.

Table 3 Activity in which the artifact received the information, and which professional entered the information by hand.

Activity	Professional who enters information	Activity description	Graphic artifact that participates in the activity
7	CLINICAL NUTRITIONIST	Visits the patient to complement information	FORM – Nutritional assessment (3)
8	CLINICAL NUTRITIONIST	Prepares the dietary prescription	FORMS – Medical and dietary prescription (1); Nutritional assessment (3); Diet map (4) BOX – Patient identification box – Nursing station of the ward (20)
13	CLINICAL NUTRITIONIST	Prescribes a diet consistent with food restriction or preference	FORMS – Nutritional assessment (3); Diet map (4)
18	ASSISTANT COOK	Applies labels to foods, supplements and beverages	LABELS – Food identification (10); Patient food identification (12)
23	NUTRITION ASSISTANT	Sends the extra order request to production	LABEL – Extra order (13)
24	KITCHEN MAID	Checks patient information	FORMS – Diet map (4)
26	KITCHEN MAID	Applies labels to meal packages	LABELS – Food identification (10); Patient food identification (12); Extra order (13)
31	KITCHEN MAID	Sends to floor and/or ward	FORM – Meals delivered per shift (19)
33	KITCHEN MAID	Delivers the meal and records any demand from the patient	FORMS – Diet map (4)
36	NURSE	Records acceptance of the diet and possible complaints	FORM – Nursing flow (23)
39	NURSING TECHNICIAN	Visits the patient and checks the acceptance of the diet	FORMS – Nutritional assessment (3); Diet map (4)

Source: Prepared by the authors.

4 Discussion of results: possible problems

In data collection carried out in the NCP at the HC/UFPR, the document Medical and Dietary Prescription/SIH generated in a digital system is also printed and used in the conduct of activities and, therefore, is subjected to the addition of information by handwriting. Thus, it is possible to infer that problems caused by handwriting when filling in the forms can affect the activities necessary for the nutritional care of the patient. The absence or lack of understanding of information can sometimes interfere with the professional decision-making at various points in the process, leading to a failure, and thus affecting the patient's nutritional indication.

Figure 4 shows details of some forms of Diet Map (A, B, C), and Meals Delivered per Shift (D), both filled in by hand by the kitchen maid, in the stages of assembly, delivery/collection of the

NCP. The Diet Map artifact is a diet prescription report, prepared by the clinical nutritionist, which contains all the meals, of a given shift, of the patients of a specific ward. In this artifact (A, B, C), information was entered by hand, as a way of creating emphasis and complementing data. The Meals Delivered per Shift form (Figure 4 – D) aims to inform the time of departure for the delivery of meals and the return of the maid, as well as the meals that were delivered and those that returned. These data are used in the evaluation of the meals that return, in the search to identify the reasons that led the patients to reject the meal. Figure 4 (D) illustrates a detail of the form filled in by hand by the maid, in an upright position. There is not enough space for recording information, which can lead to misunderstanding and cause problems with errors in obtaining and evaluating data by the nutrition team.

In the examples presented, the following problems are observed in the organization of the verbal (words and letters) and schematic (lines) elements in the forms: there is no **typographic hierarchy** that establishes an order of priority in the information, there is no **emphasis** to highlight and/or distinguish the information, causing a
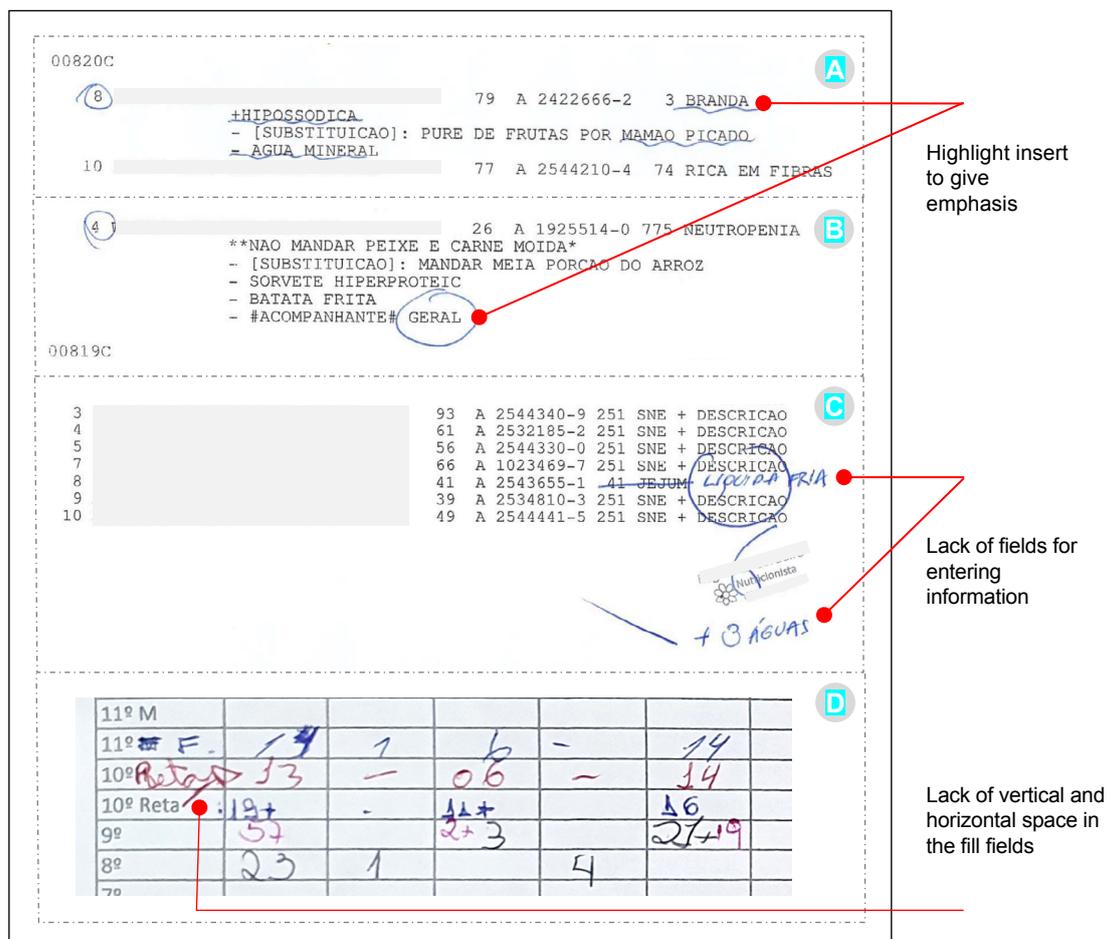

Figure 4 Hand-filled form details. Source: HC/UFPR.

similarity in the configuration of the graphic elements that makes them similar. There is also a **proximity** of the table lines, as well as **little vertical space** for filling in by hand. This can lead the professional to create ways to highlight and add information in spaces destined for other fields of information. Thus, the examples presented do not meet the information characteristics suggested by Audy et al.,(2005), in being complete, precise and clear, which are enhanced by problems related to the graphic configuration of the artifacts. In these examples, problems were identified in the scope of information design regarding typographic hierarchy, emphasis, similarity, proximity, vertical and horizontal spaces and lack of predetermined spaces for adding information (Horn, 1998; Runne Pettersson, 2012; Schriver, 1997; Waarde, 2004). Thus, the graphic configuration problems present in the analyzed artifacts make it difficult to locate the information groups. This can generate for the professionals who participate in the NCP, a demand for time to try to locate and articulate the information. As a consequence, they may come to create artifices to fill these gaps, inserting highlights and information by hand in spaces poorly sized for the number of characters required. These problems present in hand-filled prescriptions can affect the performance of NCP professionals in decision-making and reduce their efficiency in their activities (Zhang et al., 2020).

Therefore, the use of typographic and spatial aspects in the articulation of the visual field of NCP artifacts can improve the visualization and localization of content sequences, and the distinction between the main topics. In this way, they can contribute to the location and relationship between groups of information, facilitating the reading as well as the insertion of information at the time of recording the information (Schriver, 1997).

5 Conclusions and final considerations

This study presented the results of mapping the flow of information of the NCP and its graphic artifacts at the 'Hospital das Clínicas' Complex HC/UFPR, in Curitiba, state of Paraná, in order to investigate: how the nutrition care process (NCP) occurs in a public hospital for normal oral diets, focusing on the graphical artifacts into which information is entered by hand. For that, a flowchart was used as a tool to visually demonstrates how the activities are processed, and where the insertions of information in the graphic artifacts occur, through handwriting. This tool helped to locate problems related to misunderstanding and/or lack of information that could interfere with the determination and quality of nutrition services.

In collecting data about the process, the stages, the professionals involved, the activities, the means and the graphic artifacts used for recording information were considered. As main conclusions of the

mapping, problems of an informational nature were listed, caused by problems in the graphic configuration of graphic artifacts that can make it difficult to locate the information groups, necessary for the NCP professionals to carry out their activities. As a way to circumvent these problems, professionals insert highlights and information by hand in spaces not dimensioned for the number of characters required. These factors can interfere with the readability of the information that will be used in the professional decision-making at various points in the process. These occurrences that demand dedication of time to fill the informational gaps, can generate delays, interfere with the work of professionals and the time allocated to patient care.

However, it is important to know about the production of the information flow, the organization, the representation of information, focusing on the informational elements present in the graphic artifacts, for the knowledge of the context and the information demands required by the professionals involved. Prior consultation with NCP professionals at the beginning of the design process could anticipate these needs and, with this, establish aspects related to information design that contribute to minimize problems related to the registration, storage, visualization and retrieval of information during the course of the process.

The results of this study point to the need to evaluate information design aspects of graphic artifacts of the NCP flow at public hospitals, which may harm the activities of professionals who participate in the process of recording and accessing information.

Finally, it is expected that this article will contribute to the development of future studies focusing on the effectiveness of hand-filled informational artifacts that integrate the NCP at hospitals. In this sense, it is emphasized that, through the concepts and premises of information design, it is possible to guide and facilitate the organization and representation of information in graphic artifacts of the NCP at hospitals, so that the information recorded is accurate, complete, reliable, relevant and clear (Audy et al., 2005). Therefore, information design facilitates the interaction between professionals and the various NCP artifacts for error-free prescriptions in hospitals.

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