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GRAPHIC SYMBOLS FOR HEALTH AND ENVIRONMENT¹

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Abstract: Increasingly present in objects or places in the environmental scenario, graphic symbols signal socially appropriate behaviors in the most varied situations of everyday life. In relation to health, for example, they help to identify a medical service; warn about risks when operating certain equipment; prohibited differentiate and prescribed uses; they assist patients in understanding and memorizing technical information and facilitate communication between lay people and healthcare professionals. The Technical Standards Association (ABNT), a private and non-profit entity, has the mission of providing Brazilian society with normative documents that contribute to public utility and scientific development. This article aims to present a selection of the ABNT standards in force, whose content specifically presents graphic symbols for health, safety and the environment. Keywords: graphic symbols; pictograms; health; security; environment.

INTRODUCTION

There are several graphic symbols or pictograms ²used in healthcare, in hospital environments, to indicate safety measures and to represent issues related to the environment. We can cite as common examples:

- a. Red Cross: is a universally recognized symbol to represent healthcare institutions, including hospitals. It is also used to indicate the presence of medical services;
- b. Syringe, to represent the pharmacy location;

- c. Green Energy: This symbol combines an electrical outlet with a green leaf, representing clean and sustainable energy;
- d. Caduceus sign: symbol commonly associated with medicine. It features a staff entwined with two serpents and is often used to represent the medical profession as a whole;

Shape and color conventions also help us recognize safety symbols, for example, a yellow triangle with a black exclamation mark in the center is widely recognized as a warning symbol and indicates the need for caution and attention; A red circle with a downward red diagonal stripe superimposed on a specific object indicates that that object is prohibited or restricted from access to certain areas. It is important to remember that the interpretation of these symbols may vary depending on local rules and regulations, but they all have in common the objective of promoting health and general well-being.

However, the concept of health is complex, as it involves several aspects related to the health-disease process, which go beyond the biological aspect itself, also encompassing social, economic and political determinants.

On April 7, 1948, the World Health Organization (WHO) issued a concept of health, much criticized as *unattainable*, *ideal*, establishing that: "Health is the state of the most complete physical, mental and social well-being and not just the absence of illness". (*apud* GOV.BR, 2021).

In 1974, the then Minister of Health of Canada, Marc Lalonde expanded the

^{2.} The International Organization for Standardization (ISO) and the Brazilian Association of Technical Standards (ABNT) use the expression graphic symbols instead of pictograms because it is more generic and covers both pictographic signs and more abstract and conventional ones. However, the term pictogram is widely recognized by designers. The pictograms their function is to transmit messages of an informative, prescriptive or operational nature to the largest possible number of people, regardless of differences in gender, age or nationality that they may present. The Association of Graphic Designers (ADG) defines a pictogram as: "[...] its figurative design is schematic and self-explanatory and has the following characteristics: graphic conciseness, conceptual density and a communicative functionality that goes beyond the barriers of verbal language." Entry written by Sandra de Souza (Member of the Teaching Committee, at the time) and revised by João de Souza Leite. Check at: ADG. **ADG's ABC.** Glossary of terms and entries used in graphic design. São Paulo, 1998, p.84-85.

concept, alerting to the fact that the concept of health would involve four basic segments: 1- the biological, referring to genetics and life processes, 2- the environmental, relating to the elements of nature and their impact on life, 3- lifestyle, referring to quality of life conditions and 4- the organization of health care, referring to therapeutic, clinical and hospital services. (Lalonde, 1974)

In Alma-Ata, Republic of Kazakhstan, during the International Conference on Primary Health Care, promoted by the WHO in 1978, the great inequality in the area of health between underdeveloped and developed countries was discussed, the responsibility of the State in promoting health and the importance of individual and community action in the implementation of health care.

At this event, an international classification of diseases was also developed, in addition to international health regulations and standards for water quality, as it was understood that primary health care must include other care such as, for example, adequate nutrition, basic sanitation, maternal and child care, family planning, immunizations, prevention and control of endemic diseases, provision of essential medicines and integration with other sectors, such as agriculture and industry.

In Brazil, the 1988 Constitution, in its article 196, determines that: "Health is the right of all and the duty of the State, guaranteed through social and economic policies aimed at reducing the risk of disease and other health problems and universal access and equal to actions and services for promotion, protection and recovery" (STF, 1988).

GRAPHIC SYMBOLS FOR HEALTH

Regardless of the discussions for or in favor of the expanded concept of health, the fact is that design can and must contribute to ensuring that the greatest number of people take care of their health and promote health in their surroundings or community, thus ensuring good health. -being of society.

In the relationship between graphic symbols and health, we can highlight five specific uses:

- a) in medical equipment;
- b) in identifying products for professional use;
- c) in signage of health services;
- d) in campaigns to promote health and
- e) in the instructions for using medicines (Matos, 2009, p.83).

The images used in equipment and products for professional use are generally more abstract and require greater memorization effort to be used on plans, labels or professional sheets. The images used in signs, campaigns and instructions, as they are aimed at a lay audience, are more pictographic, that is, they are simplified to fit in the space and have the necessary attributes for instant, immediate decoding.

GRAPHIC SYMBOLS FOR HEALTH - ABNT

The Brazilian Association of Technical Standards (ABNT) is a private, non-profit entity, whose purpose, as the name suggests, is the elaboration, dissemination and implementation of technical standards, on the most varied subjects, valid for the entire national territory. Founded on September 28, 1940, ABNT participates as a founding member of the *International Organization for Standardization* (ISO), of the Pan American Technical Standards Commission (Copant), of the Mercosur Standardization Association (AMN) and is also a member of the *International Electrotechnical Commission* (IEC). Since 1950, ABNT has worked on conformity assessment and has programs for certification of products, systems and environmental labeling. Its norms, however, do not have the power of law; They are more recommendations than impositions, that is, their use is voluntary.

> A standard is a document established by consensus and approved by a recognized body, which provides rules, guidelines or minimum characteristics for activities or their results, aiming to obtain an optimal degree of order in a given context. The standard is, in principle, for voluntary use, but it is almost always used because it represents the consensus on the state of the art on a given subject, obtained among experts from interested parties." (ABNT/ normalization).

The standards developed by ABNT are the result of intense multidisciplinary work, from their conception to public consultation, open to the whole of society. They represent the suitability of the market for which they are intended, ensuring the desirable characteristics of products and services, such as quality, safety, efficiency, as well as environmental respect.

As stated on its *website* (abnt.org. br) "Working in tune with governments and society, ABNT contributes to the implementation of public policies, promotes the development of markets, consumer protection and the safety of all citizens" (ABNT/Institutional) In relation to graphic symbols, ABNT established, in 2012, a Special Study Commission, CEE 168, for the elaboration or review of technical standards involving any and all graphic symbols, following the example of the Technical Commission ISO/ TC 145, which already It has been operating since 1970.

At ANBT, we found 41 standards in Portuguese involving graphic symbols for health, safety and the environment and marketed by the company Target ``*Normas*`` (https://www.normas.com.br/).

The selection criteria for ABNT standards were: 1) being in Portuguese, translated or prepared for the national territory, 2) being in force; 3) simultaneously address *symbol graphic / colors* and *health (including issues relating to* safety and the environment in this health concept). The classification of symbols into priority uses (general, health, safety and environment) was carried out by the author and not by the Association.

The symbols standardized by ABNT (translated from another country or created in the national territory) and marketed by Target ``Normas`` (normas.com.br) range from the general principles of pictogram design to their application on labels and medical equipment, on safety signs and alerts for the correct preservation of the environment. As ABNT and the company that sells its standards (Target ``Normas``) do not have a refined search system, the selection was made manually, standard by standard, based on a simple search for standards with the terms graphic symbols, pictograms, health, medical symbols, symbology, signage in the Target standards *app*.

CODE OF THE CURRENT STANDARD classification	TITLE AND SYMBOLS	SYMBOL EXAMPLE
ABNT NBR ISO 7001 dated 6/2018 general	Graphic symbols – public information symbols (5th edition of 2018) Symbols of silence please PIBP 001, hospital PIPF 002, pharmacy PIPF 007, lobby or waiting area PIPF 014, wireless internet PICF 018, priority seats PIPF 022 to 026 and 041, children's health center PIPF 036, dentist PIPF 043, medical PIPF 044, accessibility PIPF 045 to 049 and 051, 055, 056, priority access PIPF 057 to 059 and 073, recycling PIPF 063 to 066, loop for the hearing impaired PIPF 072.	+
ABNT NBR 9186-1 of 5/2017 general	Graphic symbols – Test methods. Part 1 - Method for testing comprehensibility	
ABNT NBR 9186-2 of 6/2022 general	Graphic symbols – Test methods. Part 2 - Method for testing perceptual quality	
ABNT NBR 9186-3 of 8/2018 general	Graphic symbols – Test methods. Part 3 - Method for testing association with symbol referent	
ABNT NBR ISO 17724 of 8 2013 general	Graphic symbols – vocabulary	
ABNT NBR ISO 22727 dated 8/2013 general	Graphic symbols – Creation and design of public information symbols.	İ
ABNT PR1002:2020 Best practice health	Respiratory protection masks for non-professional use Photos and drawings	
ABNT PR1004:2020 Best practice health	Safe operation in organizations during pandemic situations Pictograms and drawings	$\bigcap_{i.5m} O \\ \longleftrightarrow_{i.5m} O \\ \vdots$ Figure 1 – Minimum safe distance
ABNT NBR ISO 15223 – 1 from 7/2022 health	Medical devices – symbols to be used in information provided by the manufacturer. Part 1- General requirements. <i>Symbols of manufacturing, sterility, storage, safe use,</i> <i>specific for IVD, transfusion, infusion, others.</i>	
ABNT NBR ISO 15223-2 dated 9/2013 health	Health products – symbols to be used on labels and information to be provided on health products - Part 2 – development, selection and validation of symbols <i>Symbol model also used by the IEC</i>	

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ABNT NBR ISO 16972 of 12/2015 health	Respiratory protective equipment — Terms, definitions, graphic symbols and units of measurement Symbols to see information provided by the manufacturer, expiration date, temperature, humidity.	°C °C
ABNT NBR 20301 of 12/2010 health	Health IT – Healt1h cards – general characteristics Regulates visual information written on a health card, layout examples.	Health Operator Photo Joso da Silva 809 9912 3456 7890
ABNT NBR ISO 21531 dated 9/2012 health Brazilian standard	Dentistry — Graphic symbols for dental instruments Symbols for prophylaxis, orthodontics, jaw surgery, implantology, pivot, cavity preparation, removal of old restorations, restoration preparation, apical surface smoothing, precision technique; mold casting technique, model making, acrylic technique, crown and bridge technique, ultrasonic bath, thermal washing and disinfection apparatus, steam sterilization, sterile, hand washing disinfectant, disinfectant for manual and rotary instruments, disinfectant for work surfaces, disinfectant for floors and walls, disinfectant for dental printing materials, attention, consult instructions for use, date of manufacture, keep dry, fragile, keep protected from sunlight, expiration date, do not reuse, number of uses, evolution, classification, cannot be sold separately, type of material, batch, reference, series, temperature limits, packaging unit, opened packaging is not replaced.	Symbol Title/description/application Image: Description of the system br: maxillary surgery en: jaw surgery fr: maxilla-facial chirurgie from: Kieferchirurgie Image: Description of the system pt: implantologia en: implantologig from: Implantology fr: implantology Image: Description of the system from: System (get mobile) en: post system fr: système à pivot de: Aufbaustiftsystem
ABNT NBR IEC 60601-2-52 from 3/2020 health	Medical electrical equipment – Part 2-52 Particular requirements for the basic safety and essential performance of hospital beds <i>Hospital Bed Function Controls: Guidelines for Creating</i> <i>Graphic Symbols.</i>	
ABNT IEC/TR 60878 of 12/2020 Technical report health	Graphic symbols for electrical equipment in medical practice Symbols for controls, relating to movement, electricity and electronics, light and optics, transportation, handling and packaging, security, safety signs, equipment identification, symbols relating to information and communication, image, imaging, audio, data, patient/person, patient positioning, medical instruments and blood processing, dentistry and dental equipment, patient monitoring, ultrasound, lithotripsy, electro surgery, nuclear medicine, X-ray diagnosis, CT, MRI,: functions, implantable active medical devices	4.1 General view 1 - General: Controls
ABNT NBR ISO 3864-1 dated 9/2013 security	Graphic symbols – Colors and Safety signs Part 1: Design Principles for Safety Signs and Markings	

ABNT NBR ISO 3864-2 of 2018 security	Graphic Symbols - Safety Colors and Safety Signs - Part 2: Design Principles for Product Safety Labels	DANGER A WARNING CAUTION
ABNT NBR ISO 3864-3 of 2022 security	Graphic Symbols - Safety Colors and Safety Signs - Part 3: Design Principles for Graphic Symbols for Use in Safety Signs	Figure 6 - Emergency telephone (ISO 7010-E004) Figure 6 - Emergency telephone (ISO 7010-E004) Figure 6 - Fire Extinguisher (ISO 7010-F001) Figure A.7-Examples of how the human figure can be animated using articulation points- Profile view
ABNT NBR ISO 3864-4 from 2/2019 security	Graphic symbols – Colors and Safety signs Part 4- Colorimetric and photometric properties of safety sign materials	
ABNT NBR 5556 of 12/1986 security	Symbols for identifying controls, indicators and pilot lights of road and industrial vehicles, self-propelled road machines and agricultural tractors	5.1.3 Main headight flasher - high beam 5.1.4 Main headight adjuster 5.1.4 Main headight adjuster 5.1.4 Main headight adjuster 5.1.4 Main headight adjuster 5.1.4 Main headight adjuster
ABNT NBR 7195 dated 7/2018 Brazilian standard security	Colors for security	
ABNT NBR 7392 of 7/2010 security	Ground support equipment – pictographic symbols to identify equipment controls <i>Pictographic symbols used for ground support in airports</i> .	
ABNT NBR 7500 of 3/2023 13th ed. security	Identification for land transport, handling, movement and storage of products <i>Risk labels</i>	¥2

ABNT NBR ISO 11684 dated 5/2013 security	Tractors, agricultural and forestry machinery, motorized lawn and garden equipment - safety signs and risk pictograms - General principles. Pictograms of chemical risks, electrical risks, risks of falling, risks of fluids, crushing, cutting, entrapment, thrown objects, being run over, stability, release of accumulated energy, thermal risks. Risk prevention pictograms, safety signs, drawing of the human figure, head in profile, palm of the hand, inclusion of the hand in the human figure, feet, addition of feet to the human figure, arrows, prohibited action or risk location.	
ABNT NBR 14100 1998 Revision security	Fire protection – Graphic symbols for design 162 Abstract symbols - with geometric shapes for inclusion in plans or projects.	
ABNT NBR 14725 -3 dated 8/2017 security	Chemicals – safety, health and environmental information Part 3 – labeling Danger symbols (exploding bomb, flame, flame over circle, gas cylinder, corrosion, skull and crossbones, exclamation mark, dangerous to health, environment)	Danger symbol
ABNT NBR 16330 of 7/2022 security	Auxiliary devices - Signaling barriers of various types I, II and III and easels (supports)	Figure 4 - Examples of articulated easel (support)
ABNT NBR 16820 of 5/2022 security	Emergency signaling systems – Design, requirements and test methods <i>Prohibition signs, warning signs, guidance and rescue</i> <i>signs, equipment signs, escape plans.</i>	Figure A.12 - Continued route signage at access doors Oheck the continuity and door opening demarcation requirements in 8.3 0 Minimum 1.80m 1.80m 1.80m Figure A.13 - Fire fighting signaling for upper and lower levels
ABNT NBR 6493 of 11/2019 environment	Use of colors to identify industrial piping	

ABNT NBR 8896 of 6/1985 environment	Graphic symbols for hydraulic and pneumatic systems and components - Basic and functional symbols Graphic symbols to be used in diagrams and hydraulic systems; energy sources; flows and connections; reservoirs; accumulators, filters and lubricators; heat exchangers and mechanical elements.	
ABNT NBR 8897de 6/1985 environment	Graphic symbols for hydraulic and pneumatic systems and components energy transformations Symbols for use in diagrams: pumps and compressors; engines; pumps; speed variator units; cylinders; pressure intensifiers; hydropneumatic converters	
ABNT NBR 8898 of 6/1985 environment	Graphic symbols for hydraulic and pneumatic systems and components – Energy distribution and scrolling <i>Symbols for valves</i>	
ABNT NBR 9050 dated 8/2020 environment	Accessibility to buildings, furniture, spaces and urban equipment. International symbol of access, international symbol of people with visual impairment, hearing impairment, symbol of preferential service, guide dog accompaniment, toilets, circulation symbols, communication symbols	a) White on blue background b) White on black b) White on black background b)
ABNT NBR ISO 10318-2 from 9/2021 environment	Geosynthetics Part 2: Symbols and pictograms Symbols and pictograms of products, functions, protection, applications.	Separation Barrier Filtration Reinforcement Burlace erosion control Co
ABNT NBR 10696 dated 9/2015 environment	Graphic symbols of accident diagrams of traffic accident reports (<i>abstract symbols to explain accidents</i>)	Accident occurrence report
ABNT NBR 13193 Brazilian Standard environment	Use of colors to identify industrial gases (in conjunction with ABNT NBR 6493)	

ABNT NBR 13230 dated 11/2008 environment	Recyclable plastic packaging and packaging - identification and symbols <i>Symbols for pet types</i>	PET
ABNT NBR ISO 14021 of 9/2017 environment	Environmental labels and declarations – self- environmental declarations (type ll labeling) <i>Mobius cycle graphic symbol</i>	
ABNT NBR 14100 of 3/2002 environment	Fire protection – Graphic symbols for projects Graphic symbols to be used in architectural projects in relation to fire protection equipment, ventilation, escape routes and emergency systems.	
ABNT NBR 15777 of 1/2009 Brazilian Standard environment	Topographic conventions for maps and cadastral plans – Scales 1:10,000, 1:5000, 1:2000 and 1:1000 - Procedure	
ABNT NBR 16182 of 6/2013 environment	Packaging and packaging – symbols for selective disposal and material identification guidance, Symbols of: selective, recyclable materials.	SELECTIVE-DISPOSAL

According to the previous table, between standards and technical reports, we only have 41 documents in Portuguese standardizing - by ABNT/Target ``*Normas*`` - the use of graphic symbols in the country:

- 6 general standards on public information symbols also applicable to the areas of health, safety and the environment;
- 9 related to the health area, including the dental area (medical and hospital equipment, dental instruments, breathing, pandemic);
- 13 relating to safety (colors, signs, fire, chemicals, tractors) and
- 13 relating to the environment (accessibility, traffic, disposable packaging, geosynthetics).

By the end of 2023 we will also have, in Portuguese, the ABNT NBR 7010:2019 standard - Graphic symbols — Safety colors and safety signs — Registered safety signs (category: safety).

INTERNATIONAL REPERTORIES - REFERENCES

In relation to medicines, we have two important references: the USP repertoire, from the *United States Pharmacopeia*, developed between 1989 and 1997 in the USA with 81 symbols and the RAD-AR or *Risk- Benefit Assessment of Drugs repertoire*, developed in Japan in 2006, with 51 symbols. In both repertoires, the symbols represent instructions regarding the correct way to use medicines (oral, nasal, sublingual, etc.), frequency, correct storage and usage alerts (side effects, restrictions, etc.).



Figure 1 On the left, a USP pictogram, from the United States Pharmacopeia and to the address. The same idea from the repertoire of RAD-AR, Japan: Take the remedy orally. Source: Matos, 2009, p.140.

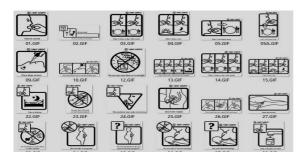


Figure 2: Some examples of pictograms from USP, United States Pharmacopeia (total: 81 symbols). Source: https://www.usp.org/ health-quality-safety/usp-pictograms



Figure 3 Pictograms from *the Risk- Benefit Assessment of Drugs* (RAD-AR), Japan. Sources: MATOS, Ciro. P. 114-116 (https:// teses.usp.br/teses/disponiveis/27/27154/tde-21102010-093920/publico/5467786.pdf)



Figura 4: Shakespear Design Studio. Pictogramas para hospitais municipais de Buenos Aires, 1976. Fonte: https:// shakespearweb.com

Universal Symbols in Health Care



Figure 5: Project: ``*Hablamos Juntos*``, Graphic signaling in North American hospitals for people with low literacy in English, in partnership with the R.W. Johnson Foundation and SEGD. From 2003 to 2010, foram developed 54 symbols.

In relation to visual programming and wayfinding in hospitals, we have the pioneering contribution of Ronald Shakespear (Diseño Shakespeare https://shakespearweb. com/) together with the network of municipal hospitals in Buenos Aires and the recognized North American project, called ``Hablamos Juntos'', present in American hospitals such as Women & Infants Hospital (Providence); International Community Health Care Services (Seatle); Children's Mercy Hospital (Kansas City) and Grady Health System (Atlanta).

FINAL CONSIDERATIONS

Despite the importance of the presence of these symbols in signage in medical or hospital spaces, on medication forms and labels, in understanding, memorizing and adhering to health treatments and collective well-being practices, it is concluded that the country still has few normative documents in this regard, which highlights the need for public policies to mix design and visual communication professionals in multidisciplinary teams and projects in the areas of health, safety and environment.

The article specifies, in a table, the ABNT standards, identified by number and date of last update, their characterization of use, a brief description of their content and an example of the corresponding graphic symbol. With this, we believe we will contribute to a greater number of people committing to active participation in the various open committees of the Association (ABNT) and in the contribution of design to the health of the population in general.

To participate in any ABNT technical committee or special study commission, simply access the *website* www.abntonline. com.br/normalizacao and inform which Technical Committee/Study Commission you wish to participate in. If interested parties wish to participate in the Special Study Commission 168 (on graphic symbols) they can also write to the Commission secretariat (denise.araujo@abnt.org.br) to obtain the necessary step-by-step instructions; It is not a requirement to be a visual communication specialist.

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