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Issues of management the technical infrastructure at the hospital

Problematyka zarządzania infrastrukturą techniczną w szpitalu

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Abstract
The infrastructure management of the hospital requires apart from typical conditioning associated with managing a property, taking into account requirements put for individuals of the health care which medical technologies are being exploited. In the article a specificity of the technical infrastructure of the hospital was described, as well as problems resulting from the completion of processes of the infrastructure management were identified.

Słowa kluczowe: infrastruktura techniczna, zasoby informacyjne, zarządzanie infrastrukturą

Abstrakt
Zarządzanie infrastrukturą szpitala wymaga, poza typowymi uwarunkowaniami związanymi z zarządzaniem nieruchomością, uwzględnienia uwarunkowań stawianych jednostkom opieki zdrowotnej, które wykorzystują technologie medyczne. W artykule opisano specyfikę infrastruktury technicznej szpitala oraz zidentyfikowano problemy wynikające z realizacji procesów zarządzania infrastrukturą.

Infrastructure in the hospital organization

The hospital is one of the most important organizational units in the system of the health care. At present, in the Polish legislation it doesn't have a separate provision of law concerning the definition, functioning or financing the hospital. A term "hospital", "research hospital", the "university hospital" is only very much appearing fragmentary, in the act from 30 August 1991 about healthcare centers [1]. According to the mentioned act, the hospital is a healthcare centre, and a healthcare centre is organizationally singled out a team of persons and properties created and held in order to grant health benefits and the promotion of health. Plants which moreover were created and are also stayed to the purpose of the diagnostic and research execution tasks, contain the marking clinical or university. The centre of Organization and Economics of the Health, but the current Centre of Information Systems of the Health Care determine the hospital as a stationary healthcare centre, in which they are granting 24-hour and all-day health benefits, medical wards, the diagnostic, treatment-medicinal and rehabilitation perpendicular and the technical-economic back [2]. European, inoperative for profit affiliating hospital doctors – AEMH defined hospital activity in the context of proposal for directive of the European Union concerning patient's rights in the cross-border health care [3] as the health care requiring all-night accommodating the patient for establishng the condition of his health at least at one night or/and activity requiring using specialist, expensive medical devices by the qualified medical staff for treating individual patients [4].

The technical infrastructure of the hospital is creating conditions for effective and safe leading the process of diagnosing, the treatment and the rehabilitation of patients [5]. The specificity of the hospital building results from diverse needs of the

medical staff and their patients and the presence of pharmacological means and the specialist medical equipment. Access of the patient to medical modern technologies, and hence to modern medical apparatus is possible only in case of the good technical level of buildings in which apparatus is functioning and good technically installations, from which this apparatus is being powered [6].

The building with its installations and the equipment constitutes the most important asset at the hospital [7], as well as crucial element of operating costs of this organization (costs of the use – of the exploitation and supporting the determined technical infrastructure). Information about these costs isn't an object of the systematic reporting [8].

Apart from standards accreditation applied by the Centre of Monitoring the Quality in the Health Care, databases don't exist – domestic or provincial which enable the technical evaluation of the hospital. According to W. Ponikło [9] hospital conditions in Poland, in which a patient is undergoing treatment aren't meeting social expectations, but also objectively will leave a lot to be desired lowering the safety of the treatment. A poor condition of the network and the installation is a consequence of the bad technical condition of hospital buildings, e.g. distribution networks of the energy, installations of supplying water, medical gasses or installations the mechanical ventilation. In April 2006 it resulted from the questionnaire survey conducted by the Department of Health, that medium age of buildings of hospital organizations, for individuals founded by the local self-government, took out 42 years, and every tenth the building was under the care of the monument conservation officer [10]. One should in addition pay attention to the fact that the time of using the hospital building is being calculated in decades, while extent of medical technology, understood as using medical apparatus given to the generation, is much shorter – it is being estimated at about 8 years. In most cases, installation of the new device – also when it is of the same type, as a withdrawn one from use – a need for extensive changes in installations is involving, as well as in spreading rooms (area, traffic routes). Changing standards of the hospitalization so as: enlarging the surface "to the bed", reducing the number of beds in rooms for sick persons, depositing plumbings by rooms for sick persons, leading to rooms the more and more large number of installations, that hospital buildings are being surrendered to frequent modernizations. In many cases, the modernization of the hospital is performed as the complete refurbishment, widened sometimes for building the new wing [6].

Specificity of the technical infrastructure in the hospital organization

The infrastructure management of the hospital requires, apart from typical conditioning associated with managing a property, taking into account conditioning for individuals of health care and for using medical technologies. The infrastructure management constitutes extremely important area at the hospital, because it is determining the potential of organizations for carrying out treatment processes, and in the more distant perspective permits the planning and the forming of the production of medical services. Providing the normal interaction of the technical infrastructure of elements entering its composition is a condition of the undisturbed functioning. Infrastructure includes [11]:

- developing the space of the work and installations associated with it,
- process equipment (both the equipment and the software),
- ancillary services (so as the transport or the contact).

According to S. Brand [12], the building consists of 6 parts about the different permanence (Tab. 1). As a layer of the building, it is entertaining allocated, homogeneous part of the building structure of the specific function and the longevity [13]. On this base layers of the building of the hospital organization were prepared (Fig. 1).

It is possible also to divide the infrastructure of the hospital organization based on the Classification of Fixed Assets, applied in the statistical reporting and in the accounting records of fixed assets (Tab. 2).

The hospital infrastructure is on the one side typical like every real estate, but on the other one – specialist, because associated with medical modern technologies [14]. The specificity of the hospital building results from:

1. having the following installations / of devices:
   - central installation of medical oxygen,
   - central installation of the compressed air,
   - central installation of the underpressure,
   - sound installation of the warning system,
   - installation of evacuation lighting traffic routes,
   - portable fire extinguishers fulfilling requirements of Polish Norms being equivalents of European standard concerning fire extinguishers or transportable fire extinguishers,
   - sound installation of the warning system,
   - installation of the signaling of the fire;

Table 1. Layer of the building according to S. Brand (so-called "6 S") [13, p. 66]
Tabela 1. Warstwy budynku według S. Branda tzw. „6 S" [13, s. 66]

Name of layer	Description	Duration
SITE	place legally determined, geographic locations, parcel, of which border and context can survive longer than the generation of ephemeral buildings	Parcel is eternal
STRUCTURE	foundations and elements transferring charges, of which the change is dangerous and expensive	the "life" the structure lasts 30–300 years, on average 50–60 years
SKIN	exterior surface of the building (the elevation and the roofing)	it is changing on average every 20 years in order to keep up with the fashion and the technology or is associated with the total repair of the building
SERVICES	"intestines" of building: electric cables, telecommunications, computer, drainpipes, the water, heating, ventilation, air-conditioning and movable parts of a building associated with the communication – lifts, an escalator	they are undergoing the wear and tear or are becoming outdated technically every 7–15 years, many buildings are undergoing premature destroying, if "intestines" are planted too deep so they could be easily exchange
SPACE PLAN	partition walls, suspended ceilings, raised floors, door	in commercial buildings there is changing every 3 years, in exceptionally calm house property can survive throughout 30 years
STUFF	phones, images, equipping the kitchen, lamps and the like; furniture of all kind	from weeks and months to a dozen years

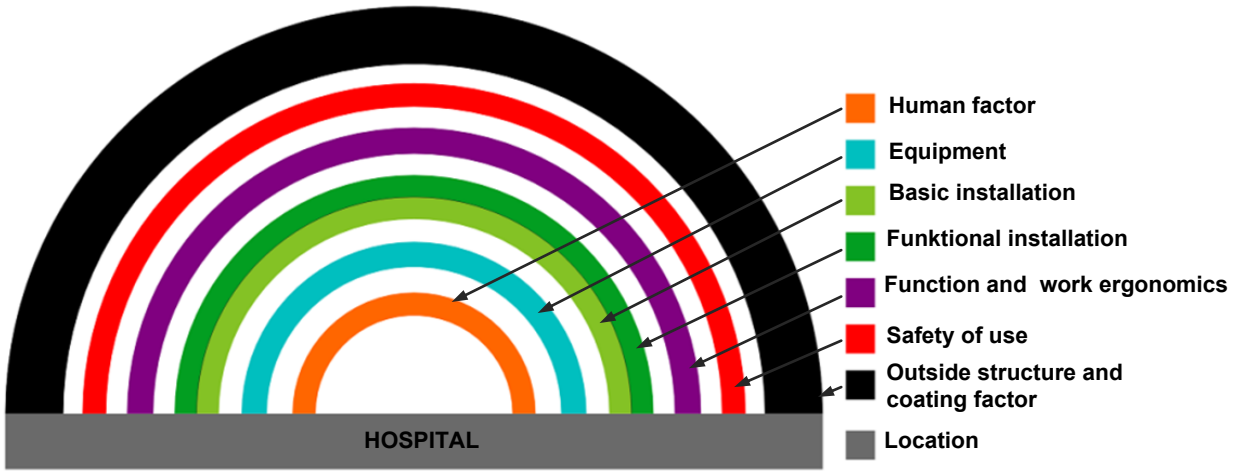

Fig. 1. Layer of the building for the hospital [source: own study on the base http://www.muratorplus.pl/technika/inteligentny-budynek/czego-mozna-oczekiwac-od-budynku-inteligentnego_62786.html, 01.09.2010 r.]
Rys. 1. Warstwy budynku dla szpitala [źródło: opracowanie własne na podstawie http://www.muratorplus.pl/technika/inteligentny-budynek/czego-mozna-oczekiwac-od-budynku-inteligentnego_62786.html, 01.09.2010 r.]

Table 2. Division of the infrastructure of the hospital organization [source: own study on the base: Classification of Fixed Assets, http://www.stat.gov.pl/klasyfikacje/kst/kst.htm)]
Tabela 2. Podział infrastruktury organizacji szpitalnej [źródło: opracowanie własne na podstawie: Classification of Fixed Assets, http://www.stat.gov.pl/klasyfikacje/kst/kst.htm)]

Division of objects according to Classification of Fixed Assets		Division of the infrastructure of the hospital organization
Group 0	Ground	Lands occupied by buildings, installations and the devices associated with the hospital organization
Group 1	Buildings and premises, the cooperative property right to the housing unit and the cooperative right to non-residential unit	Building of hospital organization
Group 2	Objects of the civil engineering and water	Pipelines, telecommunications lines and electrical power engineering, infrastructure of the transport and others
Group 3	Pots and energy machines	Technical devices (among others ventilation and air-conditioning, personal lifts) and means of transport (wheelchairs))
Group 4	Machines, devices and general-purpose apparatuses	
Group 5	Specialist machines, devices and apparatuses	
Group 6	Technical devices	
Group 7	Means of transport	
Group 8	Tools, devices, chattels and the equipment	Medical devices

Table 3. The chosen regulations concerning the infrastructure of the hospital organization [source: own study]
Tabela 3. Wybrane przepisy dotyczące infrastruktury organizacyjnej szpitala [źródło: opracowanie własne]

Category	Legal grounds	Name of the legal document
Spaces of hospital	Dz.U. from 2007, No. 14, item 89	The act from 30th August 1991 about healthcare centers (art. 9 par. 1, art. 65 par. 1)
	Dz.U. from 2011, No. 51, item 265	The decree of Health Minister from 18th February 2011 about conditions of safe applying the ionizing radiation for all types of the medical exposition
	Dz.U. from 2007, No. 42, item 276	The act from 29th November 2000. Atomic law (art. 33 par. 1 lit. D)
	Dz.U. from 2006, No. 156, item 1118	The act from 7th July 1994. Building law (art. 7 par. 2)
	Dz.U. from 2002, No. 75, item 690	The decree from 12th April 2002. Specifications which buildings and their situation should correspond to (§ 3 point 6, § 69, § 84–85)
	Dz.U. from 2006, No. 213, item 1568	The decree from 10th November 2006. The requirement, which rooms and establishing the healthcare centre should fulfill under the professional and sanitary account
	Dz.U. from 2005, No. 210, item 1756	The decree from 17th October 2005. Determining essentials element of agreements concerning the access of clinical wards on performance teaching and research tasks connecting with granting health benefits
	Dz.U. from 2004, No. 93, item 896	The act from 20th April 2004. Medical devices
	Dz.U. from 2002, No. 173, item 1419	The decree from 30th September 2002. Obtaining the title of the specialist in fields being used for a health care
	Dz.Urz. of Helth Ministry from 2001, No. 5, item 34, regulation from 28 May 2001	Determining of principles of the purchase or accepting donation apparatus and medical equipment and on the sale, the lease or renting the non-current asset by the public healthcare centre created by the Health Minister.
Illumination and ventilation	Dz.U. from 2006, No. 213, item 1568	The decree from 10th November 2006. The requirement, which rooms and establishing the healthcare centre should fulfill under the professional and sanitary account (§ 12–16)
Exploitation of premises	Dz.U. from 2007, No. 14, item 89	The act from 30th August 1991. about healthcare centers (art. 1–2, art. 20a, art. 20 par. 1 point 3, art. 43e, art. 53)
	Dz.U. from 2001, No. 57, item 602	The act from 5th July 1996. Occupation of the nurse and the midwife (art. 25 par. 6, art. 25a par. 7)
	Dz.U. from 2008, No. 81, item 484	The decree from 6th May 2008. General conditions of granting benefits agreement of the health care
	Dz.U. from 2006, No. 156, item 1118	The act from 7th July 1994. Building law (art. 3 par. 2a)
	Dz.U. from 2000, No. 20, item 254	The decree from 9th March 2000. Requirements to which rooms, devices and medical equipment should correspond to, performing the individual medical practice, the individual specialist medical practice and the group practice (§ 5)
	Dz.U. from 2006, No. 213, item 1568	The decree from 10th November 2006. The requirement, which rooms and establishing the healthcare centre should fulfill under the professional and sanitary account
	Dz.U. from 2006, No. 56, item 397	The decree from 15th March 2006. Specifications and sanitary requirements for rooms, in which it is possible to execute the practice of nurses and midwives, and requirements to which devices and medical equipment enabling to grant health benefits should correspond
	Dz.U. from 2004, No. 93, item 896	The act from 20th April 2004. Medical devices
	Dz.U. from 2004, No. 210, item 2135	The act from 27th August 2004. Benefits of the health care financed from public means
	Dz.U. from 2002, No. 75, item 690	The decree from 12th April 2002. Specifications which buildings and their situation should correspond to
Building inspections	Dz.U. from 2000, No. 106, item 1126	The act from 7th July 1994. Building law (art. 62.1, 64.1, 64.3)
	Dz.U. from 1999, No. 74, item 836	The decree of the Minister of Internal Affairs and Administration from 16th August 1999 concerning technical conditions of exploitation residential buildings (§ 5.2)
	Dz.U from 2000, No. 122, item 1321	The act from 21st December 2000 about the technical inspection (art. 14.1, 19)

Dz.U. – Journal of Laws

2. duty of meeting the following requirements:
2.1. general-spatial, building and requirements for some rooms, devices and the installation;
2.2. an operating rooms/blocks:
   – mechanical ventilation,
   – active stay of medical gasses,
   – air-conditioning;
2.3. supplying the energy:
   – double power supply from the energy network (so-called double-sided power supply),
   – generating set – at least 30% of the highest legal validity;
2.4. supplying water:
   – reserve power source into water;
2.5. the safe work with sources of the ionising radiation and with radiological devices:
   – the specifications associated with the structure of the studio,
   – the requirement associated with the installation of apparatus / devices,
   – the requirement associated with the assurance additional of equipment/installation (in it the ventilation and warning light signals).

The infrastructure management of the hospital requires moreover fulfilling many provisions of law. Chosen from them they are presented in table 3.

The infrastructure of the hospital is playing the key part in the background. If the single element isn't acting the way it should, the whole won't be functioning correctly. Disruptions of powering at hospitals have a gigantic impact on safety of patients and the staff. Apart from equipping for the lifesaving in emergencies, being on an operating theatres, hospitals must also ensure the 24-hour efficiency of the infrastructure strengthening buildings. It takes up emergency lighting, fire and burglar-proof alerts, computer infrastructure – in it the electronic file of patients and the registration system and other elements, what makes it critical part of everyday activity of the hospital.

A concept which tries to meet these requirements is "Facility Management" (FM). FM is a synonym of modern managing civil structures and spatial structures. In FM the building is treated as the load-bearing element for the management with conveniences. Maintaining objects and delivering ancillary services is a mission of this concept in the framework of required standards [15]. In principle only professional colleagues pursuing this profession know the FM definition. In Poland this date is being used for 10 years, but more widely became well-known five years ago [16]. FM is an American term determining the area of the activity of the company dealing with so-called not production possessions, in it with especially a property management which are necessary in the process of the operations of this enterprise: with office blocks, halls, magazines etc. [17]. This definition can be identified with three attributes close in meaning:

– managing diverse objects and devices,
– managing conveniences,
– managing technologically advanced objects and devices.

According to International Facility Assosiation Management (IFMA), FM is a practical coordination of physical places of employment with people and functioning of the organization. It is integrating principles of administering the business, architecture and holding technical objects. Adapting the FM notion to Polish conditions, it is possible to try to describe the scope and the way of understanding as follows: it is discipline including the entirety of connected problems from managing buildings, along with surrounding them and with the equipment and action of people tied in with these objects [18].

Problems of management the technical infrastructure in the hospital organization

The adequate infrastructure and efficient emergency systems at the hospital are guaranteeing the safe stay of patients and VISITORS and safe working conditions. The safety of patients depends in great measure on the efficiency of medical devices and their correct conservation. In 2008–2010 years empirical researches were undertaken, which had character of preliminary examinations in six hospital organizations:

– Wojewódzki Szpital Specjalistyczny nr 5 in Sosnowiec,
– Zespół Opieki Zdrowotnej in Knurów,
– NZOZ Zakład Pulmonologii Sp. z o.o. in Tarnowskie Góry,
– SPZOZ Zespół Szpitali Miejskich in Chorzów,
– NZOZ Szpital Miejski in Zabrze Sp. z o.o.,
– SP ZOZ „REPTY" Górnośląskie Centrum Rehabilitacji im. gen. Jerzego Ziętka.

Recognizing the process of management the technical infrastructure at hospitals and information resources participating in these processes was a purpose of research. Managers were a basic research unit on the position of the deputy director for of technical / stewarding the wealth or staff manager of technical department. In the research, it was used the nonrandom outline of the sampling, selecting so-called intentional attempts. Author selecting respondents expected answering acquain-

tances of issues considered in the questionnaire of the interview. The following research question was distinguished in preliminary examinations:

In what way are tidied up and made available information resouces participating in processes of the infrastructure management in hospital?

To the purpose of implementations of preliminary studies, it was used the method of the partly categorised interview. Outcomes of preliminary research were supplemented by analysis of source documentation won over at individual hospitals. They comprised from scopes of responsibilities and competence of employees dealing with the infrastructure, orders of the plant manager of the health care, plans of buildings and the installation of carriers of media in the paper form.

Conducted empirical researches allow to express a lot of conclusions, from amongst which the most important it is possible to distinguish:

1. The completion of processes of the use of the technical infrastructure in the hospital object is hindered in the result of:
   - the lack of tidying up information resources or their distracted,
   - the immediate lack of ability of replacing the specialist medical equipment in case of loss of the exploitation applicability,
   - the need to provide the technical reliability of hospital object for 24 h a day,
   - the lack of the comprehensive approach allowing to locating, the codification, the transfer and making information resources available for the plant maintenance.
2. The effective completion of processes of the use of the technical infrastructure is conditioned with availability of resources information about different types in appropriate place and time.
3. Planning and carrying out maintenance – repair work of technical infrastructure of the hospital isn't being assisted by computer tools.

Conclusions

For raising the effectiveness carrying out of processes at the hospital, there is suggested using the FM concept which can be applied via a computer system. As a outcome of literature and empirical research, the following problem, appointing direction of follow-up works of the author was formulated:

In what way to support the accomplishment of processes of the facilities management in the hospital organization for raising the reliability and the quality of providing medical services?

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