Abstracts

RoMedInf 2019

Healthcare's Digital Era

Conference of the Romanian Society of Medical Informatics

19-20 September Cluj-Napoca

Editor: Sorana D. Bolboacă

Technical and Administrative Editors: Ioana ŢARANU and Vlad NECHITA

Applied Medical Informatics

Volume 41, Supplement 1, 2019

The authors have the entire responsibility for the content of the abstracts.

Editorial

This special issue is dedicated to the 35th Conference of the Romanian Society of Medical Informatics (SRIM) held in Cluj-Napoca, a beautiful city of Transilvania, 19-20 September 2019. The RoMedInf 2019 conference cover all areas of medical informatics, both basic science and technical aspects. The main major topics of the Conference are: Health, Public Health, Clinical and Nursing Informatics; Formalization of Knowledge, Ontologies, Clinical Guidelines and Standards of Healthcare; eHealth, mHealth, Wearable Devices and Sensors; Telemedicine and Teleassistance; Big Data, Data Science, Health Analytics, Health Information and Knowledge Management; Medical Decision Support and Intelligent Systems; Health Internet of Things; Interoperability in Healthcare Systems; Medical Imaging and Signal Processing; Heath&IT E-learning and Education; Robots, Virtual Reality and Gaming in Medical Rehabilitation; Health&IT Socio-Economics; Data Security, Privacy, Patient Safety, Ethics; Standards, Social and Legal Issues; Health&IT Research, Methodological Issues, and Technology Assessment. Scientific contributions and medical informatics solutions are presented in an interdisciplinary program that gathers experts and researchers from medicine, computer science, engineerings and other disciplines.

The healthcare's digital solutions are a current reality, and the e-health/digital solutions applied in healthcare faced tremendous progress that will change in the near future the concept of healthcare. The advanced of new technologies and communications, the innovations of biomedical sensors and nano-technologies (nanotech), as well as the availability of a considerable amount of medical data will change in the future the healthcare and the way medical staff connect to the patients or with professional communities. Innovative contributions are expected from the researches and changes or utilization of before-mentioned or the new one feature are expected from all healthcare staff.

Sorana D. Bolboacă

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The two faces of healthcare digitalization. Lessons to be learned

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Abstract
Introduction: The digital revolution is here. We are witnessing its impact in all fields of activity. Healthcare is one of the domains where digital technologies have aroused great expectations, bringing almost unlimited opportunities, from electronic medical archives, EHRs, AI software for medical decision support, computer-aided learning, to medical imaging, telecare, wearable devices, nano technologies and robot-assisted surgery. It is said that "progress is not an illusion, it happens, but it is slow and invariable disappointing "(George Orwell). Not all digital solutions have led to better health outcomes and values. Most EHRs implementations are more costs oriented than patient-centred, the physician is spending more time in front of a display than with a patient, and advanced technologies solutions are costly, and so on. In the last years, voices roused to expose the "techno-utopian and entrepreneurial vision of the digital health phenomenon" (Deborah Lupton). The goal in this study is to draw a global, objective picture of the advantages and disadvantages of different digital solutions for healthcare and based on these findings, to suggest balanced approaches, avoiding pitfalls. *Methods*: This study is based on literature review (1992-2000; 2016-2019) and country reports on digital implementations and strategies for healthcare. *Results*: At the level of terminology there are three terms that described a digital environment: digitization – making information accessible in digital format, digitalization – using digital technologies in the management of digital data and information, and digital transformation - building new business models that integrate digital data, processes and technologies and are patient centred. Digitization is represented by EHR implementations. Commonly recognized advantages of EHRs are: improving clinical and administrative (including financial aspects) outcomes, facilitating research and reducing costs. Most authors consider the following disadvantages: high acquisition and maintenance costs, alterations in workflow due to a new system, privacy and security issues (vulnerable to hacking), and potential corruption of patient data due to system failure. Though the benefits of advanced AI solutions, robot-assisted surgery, computer vision, virtual and augmented reality applications are widely recognized, there are limitations that have to be considered due to subjective assumptions, predictions based on former cases and different clinical contexts. *Conclusions*: The magic word in maximizing the benefits of digitization and digitalization in healthcare is "change". Healthcare organizations have to acknowledge the cultural change implied by the digital world and to prepare all the actors involved, doctors, nurses, patients, to a new way of work and collaboration. The change has to be reflected also at the level of healthcare information systems design that has to be user-centred and to enable health data sharing between different IT systems. Strategic decisions must be made not only for organization culture transformations but also for investments in the right technologies.

Keywords:
Digital technologies; Health information systems; EHR; Health data sharing; Telecare

High performance computing in big data analytics

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Abstract
For long time High-Performance Computing (HPC) has been critical for running large-scale modeling and simulation using numerical models. The big data analytics domain (BDA) has been rapidly developed over the last years to process torrents of data now being generated in various domains. But, in general, the data analytics software was not developed inside the scientific computing community, and new approches were adopted by BDA specialists. Data-intensive applications are needed in varied field ranges from advanced research— as genomics, proteomics, epidemiology and systems biology—to commercial initiatives to develop new drugs and medical treatments, agricultural pesticides and other bio-products. Big data processing is still needed in the more HPC traditional domains as physics, climate, and astronomy, but even there adopting data-driven paradigms could bring important advantages. On the other side BDA needs the infrastructure and the fundamentals of HPC in order to face with the needed computational challenges. There are important differences in the approaches of these two domains: those that are working in BDA focus on the 4Vs of big data which are: volume, velocity, variety, and veracity, while HPC scientists tend to focus on performance, scaling, and the power efficiency of a computation. As we are heading towards extreme-scale HPC coupled with data intensive analytics, the integration of BDA and HPC is a necessity and a current hot topic of research.

Keywords:
High Performance Computing; Big Data Analytics; Computational Intensive; Data Intensive

Is the biggest problem of health-related artificial intelligence an ethical one?

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Abstract
Artificial intelligence (AI) is define by MeSH (Medical Subject Headings) as "theory and development of computer systems which perform tasks that normally require human intelligence. Such tasks may include speech recognition, learning; visual perception; mathematical computing; reasoning, problem solving, decision-making, and translation of language". The keyword has been introduced in 1986 but received lately special attention due to the access to a considerable amount of organized/structured data. The AI technology in health care has raw medical data as input on which apply machine learning algorithms and provide as a specific output. The main feature of the AI is represented by the creation of its own logic by recognizing patterns in the input data but are "black boxes" that predict well without explaining why and are case-specific, the received goal is not self-adjusted. The health-related AI applications are developed to assist the diagnosis, development of the treatment protocol, drug development, personalized medicine, and healthcare monitoring. High-Level Expert Group on Artificial Intelligence (AI HLEG, https://ec.europa.eu/digital-single-market/en/high-level-expert-group-artificial-intelligence) published the Ethics Guidelines for Trustworthy AI that listed "seven key requirements for Trustworthy AI: (1) human agency and oversight, (2) technical robustness and safety, (3) privacy and data governance, (4) transparency, (5) diversity, non-discrimination and fairness, (6) environmental and societal well-being and (7) accountability." The use of AI technology in health care and medical education arise several ethical issues regarding patient autonomy, privacy, and confidentiality, informed consent, discrimination, quantification of AI risks and benefits, responsibility, misuses, responsible conduct of AI research and testing, etc. Several AI ethical issues in health-care are introduced and discussed.

Keywords:
Artificial Intelligence (AI); Healthcare; Biomedical Ethics

Next generation 3D Virtual Human Anatomy Laboratory, using off-the-shelf hardware and software

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Abstract
Introduction: Since 2013, we have built a 3D Virtual Dissection Laboratory, at the Human Anatomy Department of our University. The laboratory includes off-the-shelf hardware and Free/Open Source Software: an advanced 2D virtual dissection table, based on multitouch (50+ touchpoints) and a 3D display matrix, using passive 3D glasses. For the software, we have used various Free/Open Source Software for Virtual Anatomy. Thus, even today, this lab is one of the most advanced 3D virtual dissection lab in the World. But, it is only one such virtual lab in our University, clearly insufficient for the needs of our thousands students. Because of these reasons our next goal was to develop a virtual dissection lab ready to be used on regular smartphones (Android and/or IOS OS), thus being available to every student who owns such off-the-shelf hardware. Materials and methods: For the development we have used some regular Android smartphones and Bluestacks Android emulator for Windows (www.bluestacks.com). The 3D files for Human Anatomy were reconstructed by us from various Free/Open Source Software and Libraries dedicated to Human Anatomy. *Results:* The reconstructed 3D anatomical models for Human Anatomy were afterwards incapsulated in a 3D PDF file, ready to be opened using the free 3D PDF reader, available on Google Play or Apple Store. That reader is able to provide a 3D virtual working environment for the users, that includes: ① Selection/Reveal or Hiding of a specific Human organ and/or system, single or together with other related anatomical structures; ② Dissection of the Human Body and/or anatomical structures, on X, Y or Z (3D) coordinates; and ③ Possibility of saving a specific Virtual Dissection session, using screen capture utilities available on Android Smartphone, etc. *Conclusion:* Our research and development have clearly demonstrated the possibility to provide and run a Next-Generation Virtual Dissection Lab using off-the-shelf hardware (Android smartphones), a 3D PDF reader and Human Anatomy models developed on-site by us.

Keywords:
Virtual anatomy; Virtual 3D dissection; Off-the-shelf hardware; 3D PDF

Are there hard boundaries between teaching and learning biomedical informatics in the twenty-first century?

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Abstract
Introduction: An educational transformation of academic teaching is ongoing, with lecture-based approaches being replaced by problem-based or team-based learning, flipped classrooms, or active and collaborative learning. Blending on-line materials with in-person meetings is no longer seen unusual even for the most conservatory faculty members. Our team began combining different teaching and assessment methods a few years ago and the first two-year cycle with separate courses for biomedical informatics and biostatistics in the medical curriculum has just ended. A two-fold analysis was conducted: students' performance on the one hand and teachers' perception on the other. *Methods*: Students' assessment scores were scrutinized for different examination components (collaborative projects, practical skills testing, multiple-choice questionnaires) for both courses, one course at a time and in combination, trying to find whether a workable connection existed between the two. Apart from personal collegial feed-back received during the academic year, and peer review of the teaching and assessment approaches, anonymous questionnaires were used to further probe teachers' opinion. *Results*: Analysis included ~400 students, the examination scores proving a good coordination between courses' syllabi and assessments. In the 13 questionnaires from teachers (6 and 7 for biomedical informatics and biostatistics, respectively), the overall mark for the last year's teaching experience ranged between 7 and 10, with various sources of frustration (e.g. general medical curriculum, course syllabus, evaluation approaches). When asked about the level of intelligence, interest and motivation of the students they had worked with, most teachers described them as "average ability students" (10 out of 13 answers). Analysis also included queries about the methods actually employed in class and perception of different levels of support received in activity. *Conclusions*: While the teaching-learning edges are obviously blurred, changing academic education needs a bidirectional endeavor and a multi-stage undertaking to help teachers actually meet their disciples.

Keywords:
Education; Medical Information Science; Active Learning; Teaching Methods; Educational Techniques

Project-centered digital health tuition for engineers: Case studies

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Abstract
This paper presents a point of view based on the experience of didactical activities for IT engineering students, in Politehnica University Timisoara. The introductory part briefly describes the specific of digital health projects. It is obvious that this domain is a very sensitive one, due to: the healthcare domain itself, heterogeneous applications, wide variation of requirements, clients less at developers' disposal, need to integrate software from different developers, need of interoperability, the target environment not permissive, difficult to finance etc. That is the reason why is difficult to convince future engineers to embrace a career in the field. The Materials and Method section describes the specific of our students and suggests ways to increase the motivation for the digital health. Our students, children of the new Millennium, don't focus too long, react to show, have instant access to information, they expect the solution from outside, they are self-oriented (a short study demonstrates that), often if failures occur, they search outside for responsibility. The tuition process must take into account this specific: the Academics must challenge the students with debates, gaining their respect, give them show, increase their responsibility, request them an activity as in software companies. As Case Studies, two projects are presented, for the Software Engineering lecture (bachelor), and for the Management in Digital Health Projects. These projects are complex ones, related to Wearable devices used in Healthcare, to Robots in drug supply in a hospital, to interoperable healthcare networks. All the projects are team works (7 up to 10 students), they imply diverse technologies (IoT, mobile, cloud, Web, Analytics), the team must deal with a global assessment and split the available points. Results are presented, conclusions are drawn and comments are made in correlation with the tuition objectives.

Keywords:
Medical Informatics Tuition; Project-Centered Tuition; Software Project

The added value of Moodle quizzes to medical statistics knowledge gain

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Abstract
Aim: In this study, the Moodle platform was used to provide undergraduate students with e-testing quizzes environment to improve their medical statistics learning outcomes. *Materials and methods*: This was a prospective study conducted with first year medical undergraduate students during 2018-2019 academic year, English section attending the Faculty of Medicine, Iuliu Haţieganu University of Medicine and Pharmacy. Eleven Moodle quizzes each covering one topic were available for 6 days after the presentation of the topic in face-to-face teaching environment. A quiz was open to be filled once, with attempts submitted after time expires not counted. The use of Moodle quizzes on the knowledge gain was compared between those with valid participation (counted as at least one, four, or three quizzes with a mark ≥ 5) as compared to those without a valid participation. *Results*: One hundred seventy-five out of 187 students were eligible for the study. The participation varied from 17% (30/175) to 42% (74/175. The quizzes marks varied from 1 to 10; 73% to 98% of students who submitted the quiz achieving the threshold of 5. Sixty-nine students never participated or have no valid participation (mark$\geq$5). The number of valid participations varied from 1 (23 students) to 11 (7 students). The number of point to the theoretical exam positively correlated with the number of Moodle passed quizzes (ϱ=0.31, p<0.0001). The group of students with valid participation (24 points at least one, 25 points for the other two criteria) archived a median higher with 2 points as compared to those without participation (p-values < 0.002) and more than one valid participation increase the median with one only point. *Conclusion*: Extra work verification of medical statistics knowledge is reflected in the knowledge again.

Keywords:
Moodle; Online Quizzes; Medical Statistics; Undergraduate Students

Medical learning applications used by undergraduate medical students in Cluj-Napoca: a cross-sectional survey

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Abstract
Introduction: This study explored the utility and attitude towards medical learning applications (MLA) among undergraduate students (general medicine) in Cluj-Napoca and the use of these apps in finding solutions to five case-based medical scenarios. *Materials and methods:* A cross-sectional design using an online survey was conducted between June 8th and July 19th, 2019. The English/Romanian students were personally invited to participate in the survey via social media platforms (Facebook/WhatsApp student groups). A three-section questionnaire was developed to anonymously collect demographic data, study habits and the answers to the five case-based medical scenarios. *Results:* Ninety-three students between the age of 19 and 50 (75% younger than 25 years, 54.5% males) participated. Most of the responding students (81.7%) were in the clinical medical education and studied up to 3 hours per day (67.7%). The use of at least one MLA was reported by 54.8%, while18.3% of these use MLA ≥2 hours per day. The MLA were mainly used for studying throughout the semester (70.1%), 29.9% used MLA only for their exam preparation. The top-three MLA were 'Amboss' (34/88), 'Medscape' (10/88) and 'Dr. Najeeb' (7/88). In most of the cases the students paid for the MLA (62.7%). The maximum obtainable score (6 points) in the clinical cases was reached only by 3 students without significant differences either between the scores of those students who used or not used resources to find the case solutions (Mann-Whitney test P=0.583, median of correct answers = 3 for both groups), or in the scores of those who used MLA, but did not solve the cases correctly (P=0.779, median of correct answers = 3 for both groups). *Conclusion:* More than half of the participating students used MLA but the MLA is not reflected in the number of correctly answered cases.

Keywords:
Medical Learning Application (MLA); Education; Medical; Undergraduate; Problem-Based Learning

Conventional vs. e-learning in medical education

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Abstract
The totality of educational methods in which a computer connected to the Internet is using refers to e-learning. More and more e-books, video and audio recordings have been appeared, which create an attractive environment for students and medical professionals educational needs. Various scientific articles, recent research results, and textbooks can be translated into e-textbooks, meaning a printed page can be viewed on computer screen. The content of these texts, in the virtual format, can be improved by adding hyperlinks which forwards to another section where some concepts and terms are explained. Textbooks can be enhanced in the virtual environment by adding a link to a movie which is showing a patient with a certain pathology (e.g., a patient with epilepsy crisis), a movie of a cellular process, an x-ray which highlights the pathology at the presence of mouse cursor. A new aspect that has raised the interest of medical professionals is "the virtual patient", a clinical case that includes a video with a consultation, a written case with pictures (e.g., to highlight the appearance of rashes). Thus, the use of technology plays an important role in the learning of clinical judgment of a student outside the consulting room or when contact with a particular pathology is limited (e.g., a student who will follow the pediatric module in the summer will have little chance of seeing a patient admitted with bronchiolitis). There are numerous studies that have attempted to demonstrate the beneficial effects of e-learning in comparison with classical education, but the results are not conclusive because interaction with the patient cannot be replaced. E-learning in the medical field appears to be a bit more effective than traditional education, generating a false impression that it would be far above traditional education. We emphasize the literature data which are focused on e-learning methods used in clinical practice or used for medical knowledge achievements by medical students and doctors.

Keywords*:*
E-learning; Educational Methods; Medical Education; Virtual Learning

Patient data security in the era of medical connected devices

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Abstract
Internet of Things (IoT) is a domain that includes embedded devices connected to a network and used in multiple applications such as: transport, telecommunications, medicine, industrial field and many others. Medical Connected Devices are IoT devices and have their origins in wireless sensor networks and extend this concept by proposing applications in which embedded devices connected to the Internet help automate user tasks. Thus, IoT devices are imagined in multiple applications, from home scenarios (smart home) to clinical scenarios.
Considering that IoT devices impact the medical practice and patient life, there is a pressing need for security mechanisms. Security is considered one of the most important IoT characteristics, but it is not considered a key factor influencing acceptance rate.
Medical IoT devices are an attractive target for attackers, as they operate with private user data and can be used as an attack vector (for example, for DoS attacks). The peculiarity of the IoT context is that a security breach can endanger human lives or privacy, as well as causing economic damage. Another particular feature of the Medical IoT context is the difficulty of designing security solutions, due to the multiple limitations of the devices, including: hardware and software limitations, lack of input-output modules, installation scenarios and more. Given these particularities of IoT devices and adding the multitude of software and hardware platforms, along with the lack of standardization, there is a pressing need for new security solutions.
Without complying with basic cyber security standards, many medical IoT manufacturers focus exclusively on the features of the devices they sell. In many cases, they do not check for vulnerabilities in the final version of the product, nor for the corresponding applications through which the product can be controlled. It could be negligence, but a more likely explanation is that this approach reduces production costs and speeds up product placement. In any case, this affects buyers who are likely to suffer financial consequences or lose sensitive information when hackers start exploiting the flaws.

Keywords:
Data Collection; Medical Device; Internet of Things (IoT); Data Protection

Real-time health monitoring systems using Internet of Things

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Abstract
With the development of Internet of Things (IoT), the medical data monitoring procedures start to implement the online and real-time data collection using specific IoT type procedures. There are many projects developed in health using IoT dedicated to every generation: form infants [1], working adults [2] and elders [3] as well. The main challenges of this new domain are: the data integration from heterogeneous sensors, the power management of small devices [4] and the management of multiple device users [5]. Our aim was to determine which IoT architecture is the most suitable in which situation. Two groups of students were challenged to create 2 types of IoT based health monitoring systems to collect several types of medical signals like ECG, heart rate, body temperature and other type of data. The first system uses an Arduino based development board and a GSM transmitter and MQTT transfer protocol to communicate with an MQTT broker, in our case the IMPACT IoT platform from Nokia. From the broker the data is saved into a MySQL type database. The second system uses an ESP8266 base development board which has an integrated WIFI transmitter to transfer the collected data into a MySQL type database. After the health monitoring systems were finalized, we have found out that these two approaches are complementary approaches. The first system is feasible when the patient is an active patient who can live an independent life but requires constant health monitoring. The second system is feasible when the patient is checked in some kind of medical care facility, nursing home, etc. and is not immobilized to the bed, but it needs constant monitoring. Both systems enable medical professionals to monitor the patients in real and by choosing the correct architecture the IoT device management requirements can be accomplished.

Keywords:
eHealth; Internet of Things (IOT); Microcontroller; GSM

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Securing PHP written medical websites

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Abstract
Medical websites, as well as patient data, and user data on medical websites, have to be secured, and effort should be put to increase the privacy of the users. PHP is one of the most used scripting languages for website development. But it is highly criticized from the security point of view. Developers should build medical PHP websites with security in mind, beside their efforts to fulfill the website purpose. The most common attacks, and security issues on PHP websites are: SQL injection attack (where an attacker tries to insert malicious code in the SQL queries); cross-site scripting (where external code is injected in the output of the website); cross-site request forgery (where unwanted commands are injected from a user that the website trusts); session hijacking (where the session ID of the user is stolen); broken authentication and access control; sensitive data exposure; error logging; using components with known vulnerabilities. Their description and ways to mitigate are presented.

Keywords:
Security; PHP; Website; Medical

Using Fast Healthcare Interoperability Resources standard in obstetrics-gynecology domain

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Abstract
The interoperability topic is very important for the digital healthcare domain, ensuring standard data gathering, continuity in processing and meaningful use of health data for human wellbeing. The exchange of information between different medical units had to be made and the interoperability ensured. The interoperability between different medical units can increase the life expectancy, reduce medical errors and provide more medical information for medical personnel, in case of an emergency the life of a patient can be saved because of a timely and quick access to information. To ensure interoperability, lately the HL7 FHIR (Fast Healthcare Interoperability Resources) standard was developed. FHIR is a standard for healthcare data exchange published by HL7 organization. The specification of FHIR describes a set of base resources, frameworks and APIs that are used in many different contexts in healthcare. The talk will cover a review of the standard and its application for the Obstetrics-Gynecology Department Information System (OGD IS). The cloud computing technology is used for storing the files in the standard format, from where can be accessed by a different accepted medical unit. The OGD IS is a web application developed using Visual Studio.NET 2015, using ASP.NET pages and C# language, the database is Microsoft SQL and the cloud used is Microsoft Azure. Using these technologies will improve the exchange of information, because the cloud is always available, the communication is fast, the only requirement is that the information system to have Internet connection.

Keywords:
Interoperability; HL7 FHIR (Fast Healthcare Interoperability Resources) Standard; Cloud Computing; Obstetrics-Gynecology

Virtual reality for stroke rehabilitation: characteristics of protocols, pilot and feasibility studies

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Abstract
Introduction: Virtual reality (VR) for stroke rehabilitation is a therapeutic intervention expected to follow the randomized control trials (RCTs) requirements. This study aimed to identify the characteristics of protocols, pilot and feasibility studies reporting stroke rehabilitation with VR methods. *Materials and methods*: A systematic study was conducted regarding publications reporting on the use of VR for stroke rehabilitation. PubMed, Web of Science, and Institute of Electrical and Electronics Engineers bibliographic databases were searched on March 2019. The keywords were ("stroke" or "stroke rehabilitation" or "neurological rehabilitation") and ("virtual reality" or "virtual reality game" or "computer-aided therapy" or "assisted therapy") and ("quality of life" or "activities of daily living"). All eligible studies published in English were included. The following were collected: experimental design, inclusion criteria for participants, age range, VR intervention, comparative intervention, the primary and secondary outcome. *Results*: Title and abstract screening stage had 326 studies, 60 entered the full-text screening stage. Five study protocols of RCTs, 1 protocol for feasibility study, 3 pilot studies and 2 feasibility studies were fully evaluated. All articles provided a structured abstract, 7 were registered in a RCT registry. All RCTs were assessor-blinded, with one exception. The upper extremity in adults was the target of the VR rehabilitation in 9/10 cases, only 2 provided the diagnostic criteria. The settings of intervention were community-dwelling (3 papers), hospital (2) or patient's home (1). Data were collected at least twice (pre- and post-treatment). The lack of details on randomization and the VR intervention did not allow for study reproducibility, despite 9/10 papers presenting randomization procedure. Four study protocols provided information regarding the sample size calculation, sample size varying between 26 and 59. *Conclusion*: Not all VR for stroke interventions were registered in a trial registry, insufficient details were provided regarding randomization and/or VR intervention.

Keywords:
Virtual Reality (VR); Stroke Rehabilitation; Activities of Daily Living (ADL); Quality of Life (QoL)

A survey of new devices and modes used in hand recovery

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Abstract
This paper is aimed at making a presentation of the devices used in hand recovery. A classification of such devices will be presented along with the main benefits brought forth as well as new development directions. Recovery devices may be classified as passive, active, haptic and coaching devices. Passive devices may only be used if patients are able to use their hands and arms. Unlike passive devices, active devices are meant to take over certain activities of the human body and the users are helped to move their limbs even if they cannot move them (for instance exoskeletons). Haptic devices (e.g. robotic gloves) may be active or passive giving feedback to the user, who has a sensation of touch or of vibration. Coaching devices are based on giving feedback in relation to the correctness or manner of performance of the recovery exercise. The gamification concept is used in this type of devices, while the coaching mode is presented with the aid of virtual, augmented or mixed reality. To use this type of devices there is no need for the specialist physician to be present and is able to monitor patient activity remotely. The Leap Motion device is also part of this category of devices. Hand recovery is achieved by means of exercises which consist in dynamic or static hand gestures. The gestures are detected by processing data with the Leap Motion device with the aid of classical methods (mathematical formulas) or by training neural networks. These methods are approached by us in detecting the gestures used in recovery. The main benefits generated by the use of coaching devices are possibility for the physician to monitor several patients remotely, providing comfort with respect to the place and manner of performance of the recovery exercises and reducing implementation costs.

Keywords:
Hand Recovery; Gesture; Recovery Devices

Informational privacy, confidentiality and data security in research involving human subjects

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Abstract
Confidentiality represents the duty to protect the privacy rights of individuals and groups. Confidentiality allows for an authorized person to disclose information in certain contexts, while the information remains protected, and its uses remain limited by an obligation to maintain confidentiality. Therefore, privacy represents the right to control sharing of one's own personal information, while confidentiality represents the corresponding duty that researchers and other controllers and processors of personal data have to protect that personal information from unauthorized access and use. Anonymized or de-identified biological samples collected from patients are often perceived as adequate to be used in any number of studies without further patient consent, given the fact that no personally identifiable information is connected to such biologic samples. However, genetic information stored in DNA is one of the most precise identifiers that can be linked to a particular living being. In similar ways, information that uniquely describes proteins, metabolites or individual combinations and traits of microbial biotopes that populate our skin or the interior of our nose, oral cavity, pharynx, or intestines, can be linked to a specifically identified individual. Therefore, a wider concept of informational privacy is required, to cover the concept of privacy in research involving human subjects. Information and data security are the means by which access to individually identifiable information is coded, encrypted and controlled, thereby protecting confidential information from unauthorized use. Limited data sharing places restrictions on the use of data to those that are authorized, or for which patient authorization exists under regulations regarding privacy, confidentiality and data security, such as the Health Insurance Portability and Accountability Act (HIPAA) in the United States (US), or the General Data Protection Regulation (GDPR) in the European Union (EU).

Keywords:
Informational Privacy and Confidentiality; Personally Identifiable Information; Data Security; Data Sharing

Applied Medical Informatics
Vol. 41, Suppl. 1 /2019, p. 17-18

Advanced texture analysis and classification methods for the automatic diagnosis of the hepatocellular carcinoma

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Abstract

*Introduction***:** The hepatocellular carcinoma (HCC) is the most frequent malignant liver tumor, appearing in 75% of liver cancer cases. The golden standard for HCC diagnosis is the needle biopsy, but it is invasive, dangerous. We develop non-invasive, computerized methods for the automatic and computer assisted diagnosis of HCC, within ultrasound images. The advanced texture analysis methods, the classification techniques including the deep learning approach, respectively other specific pattern classification and artificial intelligence methods play a major role in our research. Thus, we perform the characterization and supervised recognition of HCC, as well as the unsupervised discovery of the HCC evolution phases. *Materials and methods***:** In order to perform image analysis, both classical and original texture analysis methods were taken into account, including multiresolution features, based on the Wavelet and Gabor transforms [1]. Advanced, original texture analysis methods were developed in the form of the superior order generalized co-occurrence matrices, based on gray levels, edge orientations, respectively complex textural microstructures. These features were provided at the input of some traditional classifiers [1], [2]. Deep learning techniques such as Stacked Denoising Autoencoders (SAE) and Convolutional Neural Networks (CNN) were also experimented [3]. Thus, the imagistic textural model of HCC, respectively of the HCC evolution phases was defined in both supervised [1] and unsupervised manner [4]. The experiments were performed on 300 cases of HCC, and 100 cases of hemangioma, acquired with an older ultrasound machine, respectively on 13 HCC cases acquired with a new generation ultrasound machine. In the case of the supervised classification, we considered the following pairs of classes: HCC/cirrhotic parenchyma; HCC/hemangioma. *Results***:** Our methods led to a satisfying classification accuracy, around 85%. *Conclusion***:** Due to the textural model of HCC, both automatic and computer assisted diagnosis can be performed. We aim to increase the classification performance, in our future research.

Keywords:

Hepatocellular Carcinoma (HCC); Ultrasound Images; Advanced Texture Analysis; Deep Learning; Automatic and Computer Assisted Diagnosis

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Artificial intelligence applied to digestive endoscopy

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Abstract
Introduction: In recent years, deep learning methods have improved significantly and have been implemented in fields such as medical imaging. Applying these techniques to digestive endoscopy has led diagnosis rates for entities such as polyps similar or even better than humans. *Materials and methods*: We trained a convolutional neural network to classify medical images into two categories – with polyps or with normal mucosa – using about 800 images. For scalability and accessibility reasons, the architecture was implemented into a web interface. To our knowledge, this is the first solution to emphasize the importance of scalability and accessibility. We developed an interface that can be used in real life scenarios and is easy to use, being web enabled and accessible from any device. *Results*: Experimental results show that our solution is feasible and can be implemented in clinical practice. The model was evaluated on the test set and under these circumstances the final test accuracy was 100%. One limitation is the number of images used for training. Whereas 800 images were used in total for training, only 100 contained normal mucosa and 700 contained polyps. With future research, the number of images used will be increased and data enhancement techniques will be used, alongside with endoscopy videos. *Conclusion*: In conclusion, deep learning advances can be successfully applied to biomedical fields such as digestive endoscopy for tasks such as polyp classification, with great potential of developing tools for medical professionals.

Keywords:
Artificial Intelligence; Deep Learning; Endoscopy; Colonic Polyps

Classification of medical text using neural networks

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Abstract
Neural networks methods have recently influenced many areas, including natural language processing. The algorithms are constantly improved with increased performance compared to what exists in each domain. Learning effective representations for concepts has proven to be an important basis for many applications, such as machine translation or document classification. The correct representation of medical concepts, such as diagnosis, medication, procedure codes and visits, have wide applications in medical analyzes. Categorizing the text has the advantage to classify certain texts into certain categories that are easier to access. Each text can be classified into one or more categories. We will present a state of the art of the domain for the recent years and integrate our research results for text classification. We use neural networks to learn the classifiers in the examples and to automatically categorize other documents into the same categories. For structuring the prospectuses, we used three models of neural networks: Support Vector Machine Classifier, Naïve Bayes Classifier and 1D Convolutional Networks with sequential model. To learn these three types of neural network models, we used structured data from three medical prospect websites. We used three neural network algorithms that learn the names of certain texts in sections and predict in other texts the names of sections, after we extract from medical sections terms of interest. We created combinations between the specified sources and calculated the accuracy of the algorithms in each case and concluded which are the suitable sources for certain particular situations. Once the information from the medical brochures is structured, it can be used to create assisted decision applications that help the doctors in prescribing the correct medication. Neural networks can be a real help in categorizing medical texts so they can be used more easily in medical databases that can help physicians make certain decisions.

Keywords:
Neural Networks (NN); Medical Text; Classification; Prospects

Automated entropy-based detection of mispronounced logatomes

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Abstract

This paper presents a controlled experiment focused on the entropy-based discrimination of mispronunciations of *logatomes* (monosyllabic pseudowords). The introductory part briefly describes the related symptomology and the current challenges posed by the main objective of our research theme: the development of a software solution for the automated screening of dyslalia in early school-age children. Statistically speaking, the weight of dyslalic disorders ranks first among speech disorders, whereas from a linguistic standpoint dyslalia mainly engages the phonetic tier. Its symptoms are distortion, substitution, omission or inversion of speech sounds (phonemes) and if undetected in due time and left untreated, it may have serious consequences for the subjects' school performance and the development of their personality. A few general remarks with respect to the phonological parameters of the target consonants are also made in the Introduction section. The Materials and Method section describes the conditions, the feature-extraction technique, the technology, and the materials used in the controlled experiment. The same section also makes a description of the manner of calculation of the information entropy values of each analyzed speech sample and the manner of comparison of such information entropy values, aimed at increasing the current rate of successful discrimination of misarticulation cases. A synthesis of the achieved results is provided in the Results section based on which conclusions are drawn and comments are made in correlation with the target consonants and the influence of the phonological context thereof, in the Conclusions section. The final section also contains a discussion on further research and development of our computerized dyslalia screening solution in light of the new findings.

Keywords:

Information Entropy; Logatomes; Dyslalia; Screening

Implementation of deceleration capacity measurement algorithm in MatLab

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Abstract
Background: Impaired autonomic nervous system (ANS) tonus is involved into the pathogenesis of numerous cardiac diseases, such as atrial fibrillation and malignant ventricular arrhythmias. While numerous electrocardiographic (ECG) markers have been developed in an attempt of ANS tonus estimation, deceleration capacity (DC) proved to be an accurate marker of the vagal activity. *Methods*: 24-hours ambulatory ECG recordings of 110 patients were used in DC implementation. Automatic QRS detection and event classification was performed using PhysioNet Cardiovascular Signal Toolbox. Afterward, ectopic beats and non-sinus rhythms were manually excluded from analysis. DC measurement algorithm was implemented using MatLab version R2018a. *Results*: Deceleration capacity measurement was implemented using phase rectified signal averaging method in wavelet scale (s)=2 and timescale (T)=1. Normal consecutive sinus beats, varying less than 20% in duration compared to previous RR interval were included into analysis. On a long-term ECG recording, approximate 40.000 to 100.000 RR intervals are included into analysis. RR anchors are identified as RR intervals longer than preceding interval. Equal length segments preceding and succeeding RR anchors are selected. RR tachograms are phase rectified by aligning to each anchor RR interval and averaged. DC is calculated by formula DC=(X[0]+X[1]-X[-1]-X[-2])/4, where X[0] and X[1] are the averages of anchor RR and succeeding RR interval, while X[-1] and X[-2] are the averages of the two RR intervals preceding anchor RR interval. *Conclusion*: DC is one of the most accurate ECG marker of parasympathetic nervous system activity, having the advantage of not being influenced by artifacts, noise, ectopic beats or paroxysmal arrhythmias. DC can be easily implemented in MatLab and used in future clinical studies.

Keywords:
Autonomic Nervous System; Parasympathetic Nervous System; Ambulatory Electrocardiography; Cardiac Arrhythmias

Using Artificial Intelligence in health: call for legal regulation

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Abstract
"*Everything depends on our capacity as humanity to trace an ethical path, to define the ways of useful and reasonable uses*" (D. Gruson). Artificial iIntelligence (AI), as evoked by the term, aims to reproduce human thought, and most of the field of robotics is based on a certain level of AI. Using IA in different areas of everyday life is a very active sector in Romania. The development of artificial intelligence (AI) in health is currently experiencing a very strong acceleration with the broad multiplication of applications, particularly in the field of image recognition in radiology, ophthalmology or dermatology. Algorithmic medicine has already become a reality and will become increasingly important in the years to come. Despite the potential benefits of AI in the field of health, there are a number of elements which should be taken into account and which should be integrated because these innovations to be established in society. As no society can anymore function without rules and regulations, this field as well should be regulated (*positive regulation*). David Gruson (La Machine, le Médecin et Moi, Editions Beta Publisher, 2018) argues in favor of legal regulation of using robots and AI in health. The five keys of regulation for the deployment of artificial intelligence and robotics in health are listed by the author, as following: (1) *Information and Patient's Consent*; (2) *Guaranteeing the human in AI*; (3) *Graduation of regulation according to the level of sensitivity of health data*; (4) *Supporting the adaptation of jobs*; (5) *Intervention of independent external supervision*. These key principles could give the main orientation on the deployment of the AI ethically, in order to separate the societal benefits of societal harms. The AI should offer health care professionals and patients options and better results, and the science should be in the service of humans and of the good of society.

Keywords:
Artificial Intelligence (AI); Health; Legal Regulations; Ethical Issues

Quality of life measurement instruments for headache and migraine disorders

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Abstract
Introduction: The present study aims to achieve a comprehensive review of existing patient-reported outcome measurement instruments (PROMs) used for assessing the impact of headache disorders and migraine on patients health-related quality of life. *Materials and Methods*: We conducted a systematic search of published literature in PubMed, Medline electronic databases and specific journals. Literature search was supplemented by a manual search of retrieved articles, performed to identify additional relevant articles about the topic. We also used Mendeley, Google Scholar and ResearchGate to access any other sources and full text versions of articles. *Results:* The quality of life measurement instruments identified after the literature review are: MSQ (Migraine-Specific Quality of Life Questionnaire), SF (Short-Form Health Survey), HUI (Health Utilities Index), EQ-5D (EuroQol-5 Dimensions). Articles which are based on real data from clinical practice and are using patient-reported outcome measures (PROMs), were considered to synthesize different real-word practices/approaches/patterns/results used by researchers in the context of quality of life of patients with headache and migraine disorders. *Conclusion*: Quality of life related PROMs in paper format and especially their electronic version are valuable instruments that facilitate and improve data collection and patient use (less data entry errors, complete and accurate data, easy to administrate/management). Their multiple advantages and their integration into EHRs are also discussed.

Keywords:
Quality of Life; Headache; Migraine; Patient-Reported Outcome Measurements; Electronic Health Record

Apparent patterns in ambulance response time in Timişoara

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Abstract
Introduction: The demand for efficient and effective emergency health care is increasingly challenging and guaranteeing a prompt response in the ambulance services is an important factor for favorable outcomes in time-critical situations. This paper aims at exploring explanatory factors for ambulance response time as a performance metric, in the context of the two dispatch centers in Timişoara at present. *Material and methods*: Four area quarters were delimited in the city geographical territory, based on natural barriers and large crossover roads. These zones were further considered for analysis of the call data over the year 2018, in a cross-sectional study design. The data collected by the Ambulance Service of Timis County on all solved cases comprised the city streets with: (a) the total number of calls and the four-level emergency number of calls for each; (b) minimum, maximum, and average response time. Additionally, for each street, the geographical coordinates (latitude and longitude) were approximated and the distance to the corresponding dispatch center was calculated based on the equirectangular approximation. Descriptive statistics and a multi-variable GLM model were applied for data analysis, with further Bonferroni adjustments for post-hoc comparisons. *Results*: Although the number of calls and the patterns of priority were indistinctive within the four zones, we found significant differences between the response times in the northern and southern zones, with differences of up to 3 minutes in the estimated arrival time. Statistically significant area-related differences were observed in the predictive factors for the response time: distance to the dispatch center and emergency code. *Conclusion:* A supplementary dispatch center in the northern area would help improving the ambulance time to arrival and compensating the differences between North and South of Timişoara.

Keywords:
Emergency Medical Services; Ambulance Dispatch Centers; Ambulance Time to Arrival; Pre-Hospital Delay

A practical tool for assessment for evaluation of the information systems in medical laboratories in terms of quality assurance

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Abstract
The advent of information technology in the medical field has increased tremendously. This occurs especially in the case of medical laboratories where, with the exception of microbiology examination, most of the examination processes are automated. Besides this, almost any laboratory has implemented an information system which manages the flow of information from the sampling to the result validation. Standardization plays an important role since quality assurance is a requirement that has to be met in order to operate on the market. ISO 15189:2013 is the international standard of choice in the field. In Romania, any laboratory that aims at contracting public funding must provide, by means of accreditation against this standard technical competence. This standard contains special requirements that have to be met by the information system deployed in the laboratory. However, the requirements are not detailed such that the assessor would determine if the requirement is met or not. The present paper introduces a practical assessment tool for the assessor such that it would help decide if the specific requirements to the information systems of the ISO 15189:2013 are met. The tool can be used for any type of laboratory: hospital, individual, chain and so forth. Besides the assessment tool, the paper also discusses the main type of information systems deployed on the Romanian market of medical laboratories.

Keywords:
Quality Assurance; Medical Laboratory; Information Systems' ISO 15189:2013

Sources of information on medicines: a comparation between Romania and other European countries

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Abstract
Doctors are required to discriminate between different types of online information sources. The official source of information on medicines in Romania is the *Nomenclatorul medicamentelor* published online by the National Agency for Medicines and Medical Devices. In addition, there are several commercial mobile applications and websites that assume the role of informing doctors or patients, but the accuracy of the information, the frequency of updates, the degree of objectivity and independence from the pharmaceutical industry of these media are not well determined. As a starting point, a review of existing digital sources of information on medicines in Romania and other European countries is made. Principles as to how digital sources can be used are needed to provide clarity to healthcare professionals, patients and medicines regulators.

Keywords:
Drugs Mobile App; Patient Leaflet; Summary of Product Characteristics; Medicines Digital Sources

Structural equation modelling for assessing the psychosocial risk factors of abortion on demand

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Abstract

Introduction: In Romania, an increasing number of women are opting for abortion on demand, despite the large variety of contraceptive methods and their ease of use. Some of the factors that influence the decision of undergoing abortion are family, education and income. The aim of our study was to observe to what extent psychosocial factors had an influence on the decision of abortion on demand (DoAoD). *Material and methods*: Data were measured during a sociological survey-based study, including 603 patients who presented for abortion on request during the period 2015-2018 at the "Bega" University Clinic of Obstetrics-Gynecology, Timisoara. The study investigated the degree of information and use of contraceptive methods at the moment of pregnancy's termination request. Based on measured data, the considered latent constructs were women's general perception of abortion, emotional involvement regarding the pregnancy, relationship and family context, knowledge about the abortion's consequences, and social status. A structural model was derived, describing the direct (and indirect) effects among latent variables. *Results*: The DoAoD model showed significantly adequate fit ($\chi 2/df=1.53$, GFI=0.91, CFI=0.98, RMSEA=0.05, and $p<0.001$). The model also showed adequate fit with significant direct effects of general perception of abortion on DoAoD ($\beta=0.158$, $p<0.001$), emotional involvement regarding the pregnancy on DoAoD ($\beta=0.176$, $p<0.001$), relation and family context on DoAoD ($\beta=0.201$, $p<0.001$), and social status on DoAoD ($\beta=0.193$, $p<0.001$). The multi-factor analysis showed that the structural model was significantly different between women living in urban and rural areas, with social status completely mediating the relationship between DoAoD and latent variables in urban area and partially mediating the relationship in rural area. *Conclusions*: Results support the use of structural equation modeling for investigating the moderating and mediating effects, while simultaneously measuring latent constructs. Also, results showed that social status was a stronger mediator to the DoAoD than emotional involvement regarding the pregnancy relationship.

Keywords:

Abortion, Legal; Psychological Factors; Surveys and Questionnaires; Latent Class Analysis

Doctors' access and dissemination of medical information through social media

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Abstract
Aim: The purpose of the study was to analyze the way in which doctors, in contract with the Health Insurance House in Romania use social media (SM) in accessing and disseminating medical information. *Material and method*: Family doctors and dentists who during the year 2017 had a contract with the Romanian National Health Insurance House represented the targeted sample. 8,497 e-mail addresses and 5,422 telephone numbers were identified and collected from the web page of the National Health Insurance House. The invitation to participate in the study (including the link to the online questionnaire) was sent by SMS, Whatsapp, and / or email during 24 May - 14 July 2017. The experimental design was cross-sectional. In the statistical analysis the following generations were defined: "Baby Boomers", aged between 51-70 years, Generation X as people aged 38-51 and Millennials under 38 years. *Results*: One hundred and twenty valid questionnaires were analized. The profile of the respondent was women (61%), from urban (71%), specialist physician (50%) working in privat practice (70%). The majority of respondents use Facebook (85%). Generation X connect more to SM from public places as compared to Baby Boomers (p=0.007). Doctors seek medical information on SM monthly (83%) but rarely give advice through SM to colleagues (28%) or contribute to patients' medical education (32%). Most physicians interact with their patients through SM (59%), but do not discuss with them about how to search for health information. *Conclusion*: SM has a low usage among the doctors who perform their medical activity in Romania. As expected, age is a factor that determines the susceptibility of SM usage by Romanian doctors. SM is mainly used to search medical information but not contribute to patients' medical education.

Keywords:
Social Media (SM); Physician; Health Information

Correlation between vectorcardiographic and echocardiographic parameters in patients with cardiac resynchronization therapy

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Abstract
Introduction: Echocardiographic improvement of left ventricular (LV) contraction after cardiac resynchronization therapy (CRT) is an acute endpoint. However, small changes of CRT stimulation parameters may induce large variation of echocardiographic synchronism. Our aim was to investigate correlation between vectorcardiographic (VCG) parameters and echocardiographic parameters before and after CRT and whether VCG can be used as a marker of echocardiographic improvement. *Materials and methods*: Echocardiographic parameters of LV dyssynchrony, such as interventricular mechanical delay (IVMD), septal-to-posterior wall motion delay (SPMWD) and posterior wall contraction to mitral valve opening (Qpp-Qmi), were measured before and after CRT. Short term 12-lead electrocardiographic (ECG) recordings with 500 Hz sampling frequency and 1 microvolt sensitivity were acquired before and after CRT. MatLab R2018a software was used for signal processing and VCG measurement. Distributions were assessed for normality using Kolmogorov-Smirnow test and correlations were assessed using Pearson's or Spearman's test, accordingly. *Results*: A total of 14 patients were included. QRS area correlated with both IVMD ($p=0.02$, $r=0.47$) and Qpp-Qmi ($p=0.01$, $r=-0.52$), while difference of QRS area before and after the procedure correlated with difference of SPMWD ($p=0.01$, $r=0.83$). Similarly, area T azimuth correlated with both IVMD ($p=0.0001$, $r=-0.82$) and Qpp-Qmi ($p=0.01$, $r=0.53$), while difference of area T azimuth before and after the procedure correlated with difference of SPMWD ($p=0.03$, $r=-0.76$). Difference of peak QRS magnitude correlated with difference of SPMWD ($p=0.03$, $r=0.66$). QRS-T angle correlated with IVMD ($p=0.002$, $r=0.62$), while Wilson's spatial ventricular gradient correlated with Qpp-Qmi ($p=0.002$, $r=-0.62$). *Conclusion*: Recent studies reported that VCG is relevant in the context of cardiac resynchronization therapy (CRT) as it improves device optimization, patient selection and reduces rate of non-responders. Consistent with previous works, we reported that VCG parameters correlate with echocardiographic LV synchronism. VCG parameters, especially QRS area and area T azimuth, could be used as a marker of acute echocardiographic improvement of LV function following CRT.

Keywords:
Biosignal Processing; Vectorcardiography; Echocardiography; Cardiac Resynchronization Therapy

Characterization of retinal vessels by fractal analysis: its importance in pathology

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Abstract
The retinal circulation is the only part of human circulation that can be directly observed by ophthalmosopy. By this assessment, a lot of connection between the appearances of retinal microcirculation has been already established. Diabetic microangiopathy observation on retinal circulation or hypertension microangiopathy is already classified and contributes to the diabetes mellitus and hypertension evolution characterization. A more precise assessment could be achieved by measurements of the vessels calibers directly and by characterization of this parameter in health status, and several vascular disorders. Fractal analysis is a method that was already applied to analyze the living organism's parameters, and the human retinal network and branching pattern was demonstrated to have a fractal structure. In this study we analyzed the fractal dimensions characteristics of human retinal vessels associated with various diseases that can contribute to the estimation of cardiovascular and cerebrovascular risk. Fundus photography appearance and formula calculation are described to systematize this novel approach of vascular risk factors based on retinal vessels caliber and branching pattern. This precise measurement could contribute to the diagnosis and evolution characterization of microvascular disorders which affect the retinal vessels.

Keywords*:*
Retinal Vessels; Fractal Analysis; Vascular Disorders; Diabetes Mellitus; Hypertension

Patients' attitudes toward national healthcare system

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Abstract
Studies on patient satisfaction for healthcare service quality and access are a very important part of the overall evaluation of healthcare system and the basis for the forming of national healthcare policy. The aim of the study was to identify the perception on quality of healthcare system through the opinion of the Romanian patients. In order to evaluate the level of satisfaction with the healthcare system in general and its components, a descriptive research was performed. The data were gathered using face-to-face interviews with patients, based on a questionnaire. The study reveals that for the analysed period 14% of the sample never used the Romanian healthcare system and 36% used it ones. 65% of the sample used the healthcare system between 1 to 3 times and 63% of the respondents do not trust the system. The majority of the Romanian patients (84.65%) take into account the doctors opinion in the case of illness. The conditions and facilitators offered in the Romanian hospitals are perceived at a low level. More than a half of the investigated respondents are unsatisfied and very unsatisfied in respect with the overall impression of the Romanian healthcare system. The research reveals a strong statistically significant relationship between confidence and overall impression of the healthcare system and the age and studies.

Keywords:
Healthcare; Patient Perception; Patient Satisfaction; Romanian Healthcare System

Processing the data collected over time improved the knowledge discovery in the case of a QoL questionnaire

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Abstract
The objective of this study was to evaluate if linguistically-translated Norfolk Quality of Life for Diabetic Neuropathy questionnaire (QoL-DN) can predict mortality in patients with diabetes mellitus. A subset of 2,083 patients with diabetes mellitus was followed for 4 years, patients from 51 Romanian Diabetes Centers included in a 2012 epidemiological study. Patient were divided in two groups, the first one containing 481 patients from one center from Cluj-Napoca used to compose the risk mortality questionnaire and the second one containing 1,602 patients outside the Cluj center (the country group) used to confirm the predictive value of it. High scores for 27 questions had the power of discrimination between subjects who died and those who survived in Cluj group ($p<0.05$). We therefore propose a Norfolk QoL mortality risk score (MRS): the sum of the significant statistically questions (for mortality) with response Yes (1) / No (0) or with Likert scale response from 0 (Not at all) / 1 (A little) / 2 (Somewhat) / 3 (Moderately) to 4 (Severely). The MRS ranged from -4 to 72 was significantly greater in those who died compared with survivors (25.84 ± 3.02 vs. 14.99 ± 0.62, $p<0.001$) in Cluj group. The cut-off for the MRS was obtained using ROC (receiver operating characteristics): 11.5 (Sensitivity=83.9, Specificity=46.7, area under the curve (AUC)=0.699, $p<0.001$). When comparing deceased and survivors in the country group we found the same results for MRS (26.34 ± 1.06 vs. 15.12 ± 0.39, OR (odds ratio)=1.04, 95%CI 1.03 to 1.06, $p<0.001$). The cut-off 11.5 for the MRS obtained previously was analyzed: Sensitivity=80.8, 95%CI 74.8 to 85.9; Specificity=50.9, 95%CI 48.3 to 53.6, $p<0.001$. We propose here a composite of items derived from the Norfolk QoL-DN questionnaire as a novel "Mortality Risk Score" that can prospectively identify patients with a mortality risk over a period of 4 years.

Keywords:
Knowledge Discovery; Diabetic Neuropathy; Quality of Life; Receiver Operating Curve (ROC); Mortality

Healthcare in evolution: motivation, education, innovation

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Abstract
We are witnessing now the rapid pace of innovation in all domains and healthcare is no exception. However, we see innovation in healthcare moving slower than most of the other fields and despite the fact that we see so many problems that new technologies and new understandings could solve the progress is rather deceiving. A number of innovation management methods have been also expanded from the business and technical fields towards healthcare, and are now extensively implemented, with variable results. Having worked in the last 3 years with healthcare innovators in startups or research institutions all across Romania and all over Europe I would like to summarize my personal observations as well as propose a process focusing on finding the most relevant people in terms of motivation and attitude, providing them with the right set of skills, growing them in a supporting and challenging environment and then exposing and empowering them gradually. We will review the arguments and the decisions to be taken at each step, and focus on handling the inevitable obstacles. As much of a slogan this can sound, innovation in healthcare is done by people, with people, for people, and impactful innovation in healthcare keeps this in mind. Always!

Keywords:
Healthcare Innovation; Healthcare Technology Transfer

Informatics in nursing. Current and future trends

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Abstract
The need for knowledge in the medical field and computerization, have increased significantly in this century and from the point of view of nurses. It is essential that future basic training programs for nurses include concepts related to the role of computer technology in clinical practice. We have mentioned several classification systems in nursing, useful in generating and processing nursing databases, to facilitate the description and comparison of nursing practices (International Clinical for Nurses Practice (ICNP), North American Nursing Diagnosis Association (NANDA), Clinical Care Classification (CCC), and the Nursing Diagnostic System of the Center for Nursing Development and Research (ZEFP)). We tried to apply the IMIA-NI plan: Strategic plan 2017-2020 as accurately as possible. Applying the strategic plan, we have elaborated IMIA-NI Representative Annual Report Nursing Informatics / Romania 2019. In order to raise the level of computer science education in nursing, we developed an innovative curricula model in medical informatics, biostatistics; masters were created so that nurses could obtain the necessary credits for enrollment at the next important stage, at the doctorate, thus resulting in a developed research. The vision for the future will be the use of telemedicine, telenursing, to exchange information from one place to another, in order to improve the patient's health. Nurses will be able to access electronic patient record (EHR), provide patients with health care information, as well as educational materials. As such, nurses must be sustained by excellent electronic records of medical data, as well as other technologies. Information technology will provide this profession with a faster capacity for producing and disseminating new knowledge in the field of nursing. The brief presentation of the justifying terminologies in nursing practice has introduced several of the information management tools used by nurses in their work.

Keywords:
Nursing informatics; IMIA-NI; Electronic Health Record

National training system for simulation in anesthesia and intensive therapy and other specialties – SimLab

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Abstract
Introduction: The SimLab project addresses quality performance issues in emergency care, through a systemic approach to the lifelong learning program. *Aim*: The main educational objective is to train the residents of anesthesia and intensive care, the students, as well as the nurses. *Materials and Methods*: The SimLab project emerged from the need to develop practical skills and improve the quality of the medical act. The capacity of the simulation centers will be supported both by implementing training courses and by supporting the appropriate equipment and materials. Specific maneuvers will be practiced in accordance with the curriculum. Training sessions will be organized through clinical scenarios with varying degrees of difficulty and carrying out an examination program. The development of the modules will be determined according to the curriculum and the objectives pursued. *Results*: The aim is to create new simulation centers and train new trainers. New partnerships will be created between simulation centers and medical universities, the implementation of a well-established practical basis and the training of trainers. The simulation activities follow a protocol developed by the SimLab teachers and instructors, specifying the educational objectives, the way to achieve them, as well as the necessary equipment. During the SRATI Congress 2019 - Sinaia, workshops and trainings were organized. These continued in the simulation centers in Târgu Mureş and Munich. A simulation center was created in Timişoara, proposing to obtain, until 2021, the international accreditation SESAM. New simulation centers will be created. *Conclusions:* The achievement of a national training system in anesthesia and intensive care and other specialties has been achieved, with an important role in strengthening a base in the deepening of the main techniques practiced in major emergencies.

Keywords:
Simulation centers; Anesthesia and Intensive Therapy Training

The identification of the level of knowledge of nurses in the field of hand hygiene through a questionnaire applied within an educational program

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Abstract

Introduction: The level of knowledge on hand hygiene (HH) and healthcare associated infections (HAI) directly influences the practice of HH of medical staff and the rate of HAI. Continuous Medical Education (EMC) is an important way of improving knowledge, increasing compliance with HH and reducing HAI rates. The aim of the study was to evaluate the knowledge of nurses regarding HH and HAI in order to identify their educational needs. *Materials and methods:* In February-June 2018, a study was conducted which included nurses participating in an educational program on HAI management theme. A questionnaire with 25 items from the following 6 specific areas: HAI, HH, disinfection and sterilization, standard precautions and precautions towards the route of transmission, accidental exposure and medical waste management were used to assess the knowledge. *Results:* A total of 236 nurses were included in the study. The average age of the participants was 45.60±11.92 years, and the average work experience was 14.80±13.34 years. The average grade of the group was 8.38±1.03. This correlated negatively, but weakly and insignificantly, with the age (r=-0.033, p=0.703) and the work experience (r=-0.072, p=0.282) of the participants. 32.2% of the participants had a very good level of knowledge, but 67.8% had an inadequate level (with satisfactory and good qualifications in the assessment of knowledge). There have been identified 3 important specific areas where nurses have encountered difficulties in identifying the right answer: HAI, HH, disinfection and sterilization. *Conclusions:* 67.8% of nurses have inadequate knowledge of HH and HAI prevention, and 39% of nurses have an insufficient level, which may be a potential barrier to HAI prevention. Identifying specific areas where nurses have knowledge deficits facilitates the development of an EMC strategy centered on the educational needs of nurses.

Keywords:
Nurses; Knowledge; Hand Hygiene; Healthcare Associated Infections; Continuing Medical Education

Burnout, perceived stress and work satisfaction of intensive care unit nurses

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Abstract
Introduction: ICU (intensive care unit) nurses may be exposed to considerable stress of work, and the high levels of stress affect the quality of nursing and the quality of work life. Recurrent factors contributing to work satisfaction and implicitly the quality of work life of ICU nurses includes autonomy, professional stress, and collaboration between nurses and physicians. Our study aimed to determine the occupational stress levels, burnout syndrome and work satisfaction among ICU nurses. *Method and materials*: The research was conducted in the Intensive Care Unit of Emergency Clinical County Hospital of Oradea, Romania. Data were collected using a questionnaire, 29 nurses (of the 35) were selected for this study. Professional stress factors have been assessed through Expanded Nurses Stress Scale (ENSS), burnout syndrome through Maslach Burnout Inventory HSS (MBI-HSS), while work satisfaction was measured by the NDNQI – Adapted Index of Work Satisfaction. *Results*: The highest levels of stress were associated with workload and conflicts with other health professionals, professional relationship between nurses have been described as the least stressful. About burnout levels, a high score for emotional exhaustion and depersonalization, and a low score for professional achievements were obtained. Professional satisfaction has reached an average level, relationships between nurses achieved the highest score, while organizational policies recorded the lowest score. Pearson's correlation analysis identified professional stress (r=-0.366, p= 0.007), burnout syndrome (r=-0.334, p 0.025), conflicts with physicians (r -0.378, p= 0.008) as factors that negatively correlate with. Active coping (r=0.609, p<0.001) and emotional support (r=0.416, p=0.025) positively correlated with work satisfaction. The fidelity of the scales was verified by the Cronbach's alpha coefficient with values of 0.98 for ENSS, 0.73 for MBI-HSS, and 0.74 for NDNQI Adapted Index of Work Satisfaction.

Keywords:
Occupational Stress; Burnout; Professional Satisfaction

A practical tool for assessment the GDPR requirements implementation in hospitals at the level of nurses' desk

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Abstract
Nowadays, most healthcare providers have deployed large information systems in order to automate as much as possible the medical workflow. Besides this, more and more centers share medical information such as images, test results and so forth in an ongoing attempt to minimize the time required to make a therapeutic intervention. While the benefits of all these are well known, a new challenge has to deal with, namely assurance of patient data protection. This is crucial, especially since we sensitive medical information is shared. The new EU Regulation 679 / 2016 has specific requirements for personal data protection. Regulators but also accreditation bodies have to assess if there is an adequate level of privacy for personal medical data. The paper outlines a novel tool in order to assess the fact just previously mentioned at the most critical step of data processing: nurses and medical operator. Fulfillment the requirements of the new General Data Protection Regulation (GDPR) are also important in Romania since the Hospitals' Accreditation Body has to assess when performing general hospital quality assurance assessment. The main focus is at the level of nurses who, in Romania, are also in charge with patient data input, data dissemination, output, and communication. Therefore, at this level (nurses) most data leakage might occur. This is especially true since these tasks are side-part of their main activity: medical assistance and their limited training with data protection concepts and practice in an electronic in most of the time online environment.

Keywords:
General Data Protection Regulation (GDPR); Nurse; Accreditation; Assessment

Breast cancer pathology, types of neoplasia and number of cases in a General Surgery Department

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Abstract
Introduction: Quality of Life (QOL) is a complex concept considered a construct with many different facets which has a strong impact in the socio-medical field. Diagnosis of breast cancer or any other type of neoplasm, together with the manifestation forms and the modern therapeutic schemes it causes a major mental stress on the individual which can be manifested by emotional instability, the tendency of abandonment, or low therapeutic compliance, all of these can negatively affect the QOL of the oncologic patient. *Objectives*: Our study aim is to determine the number and the types of breast cancer pathology encountered in the activity performed within department of general surgery I for a period of 2 years: 2017-2018. *Method and materials*: In order to attend our objective the study design is retrospective observational and we used descriptive statistical analysis of the surgical activity in patients with breast cancer within surgery department I of Emergency Clinical County Hospital of Oradea for the period 2017-2018. *Results*: In 2017, 32 surgeries were performed for breast neoplasm (n=32), in 2018, 12 surgeries for breast neoplasm were performed (n=12), in the analyzed period, the most vulnerable age category was found to be between 46-55 years old (36.4%), the most common type of neoplasm encountered was infiltrative breast carcinoma (36.4%), followed by mixed ductal and lobular carcinoma with a frequency of 10%. The most commonly encountered secondary diagnoses were: obesity, axillary adenopathy, high blood pressure, and fibrocystic mastosis. Radical surgery – total mastectomy - suffered a number of 10 patients (22.7%) and partial surgery - section - there were 20 patients (45.4%). Thus, due to the early diagnosis of neoplasia, conservative surgery is preferred, which has a much lower impact on the QOL of the oncological patient.

Keywords*:*
Breast Cancer; Quality Of Life (QOL); Oncologic Patients

Old goals revisited. The nursing electronic record

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Abstract
Introduction: Digital technology has a tremendous impact on all sectors of health care. The advent of Electronic Health Record (HER) in healthcare systems and clinical practice has led to a greater appreciation of the importance of nursing documentation data. The aim of our work was to identify the state-of-the-art of implementation of nursing minimum data sets in different countries, the millstones encountered and ways to determine Romanian healthcare community to widely adopt the electronic nursing documentation record. *Methods:* Our study is based on a literature review (1995-2019), including conference proceedings, enhanced by an oral survey conducted for public hospitals and two private hospitals in Romania. *Results:* In most hospitals from USA, Canada, UK and EU, Australia and New Zeeland the transition period from nursing paper records to EHR started years ago and is still an ongoing process. In England the Government has committed to making all records concerning patients and care services, digital, real-time and interoperable by 2020. In EU, regarding Nursing Minimum Data Sets (NMDS), the most advanced implementation is in Belgium. A comparison of different NMDS implementations has shown, besides differences in advantages and disadvantages, there is not a unified view on what data must be included. In Romania, the EHR is mainly based on Diagnosis-Related Groups (DRGs) and do not include nursing documentation data. Moreover, with one or two exceptions, there are no paper-based nursing files. *Conclusions*: Electronic nursing documentation records and NMDS become a must in the digital era. Though there are valuable operational implementations of NMDS at the level of several countries, data sharing requires a broader consensus regarding nursing standards and classifications of nursing diagnosis, interventions and practices. Systems like ICNP, NANDA, ICF, and ZEFP must be further developed and improved to allow cross-mappings and capturing of multi-cultural aspects. Regarding Romania, the first steps toward an electronic nursing record are to update the nursing curriculum in all medical universities to include standards and classification systems and examples of nursing documentation files.

Keywords:
Nursing Documentation Record; Nursing Minimum Data Sets (NMDS); Nursing Informatics; Electronic Health Record (EHR)

Formal model for a balanced and healthy nutritional plan

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Abstract
In the informational era a new challenge for every person using digital devices is to inform and implement healthy nutrition methods. The same challenge is for application developers who want to highlight the research that nutritionists have managed to do in healthy nutrition. The advantages of formal methods are the understanding of mechanisms by non-nutritionists. This result is given by the identification of the variables that define the formal model and the realization of the chart that allows the understanding of the entire nutritional plan. Identifying the model for establishing the nutritional plan in the personalized diet: 1. Medical practice and literature suggest that the main Steps for establishing a balanced nutritional plan that a specialist should follow is the following the level of physical education - depending on the activity of each person, the group to which it belongs is identified: sedentary, easily active, very active, extremely active; 2. based on weight and height, the body mass index (BMI); 3. Age; and 4. The basal metabolic rate (RMB) is established using the formula of Harris-Benedict, which was identified in 1919 that calculates our daily caloric requirements:

- For men: MB (kcal/day) = 66.5+13.75×Weight(kg)+5×Height(cm)-6.78×Age(years)
- For women: MB (kcal/day) = 655+9.56×Weight(kg)+1.85×Height(cm)-4.68×Age(years).

Variables are grouped according to each person's specificity: gender, weight, height, and level of physical effort. It can actually be a grammar G that generates a diet relative to previous restrictions.
Activities to establish a proper nutrition can be done through generative and recognition devices in relation to Chomsky's hierarchy. Build a language associated with each of the conditions / restrictions considered.

Keywords:
Computer Models; Formal Healthy Diet; Nutritional Status

Analysis of the baccalaureate performances of nursing candidates at the Timişoara, Cluj-Napoca and Bucharest Universities

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Abstract
Introduction: The substantial technological developments in medicine and nursing may warrant research to improve the scientific curriculum during high school. The aim of this study was to analyse the high school baccalaureate degrees of students accepted to study nursing at the Timişoara (UMFT), Cluj-Napoca (UMFC) and Bucharest (UMFB) Universities. *Materials and methods*: Nursing students accepted by the 3 universities during 2018 (UMFT, 100, UMFC, 100 and UMFB, 96) were matched (69, 64 and 54) against the national baccalaureate registry. Most candidates were females (89%) and were coming primarily from Timis (28), Cluj (22), and Hunedoara counties (19) or Bucharest (17). *Results*: The proportion of mathematics degrees was higher for candidates accepted by UMFB and UMFC (83% vs 77% vs 51%, p=0.0002). Anatomy was the optional degree for most candidates at UMFC and UMFB (both 69%), while candidates from UMFT had either geography (46%) or anatomy (38%) as optional degrees. Most candidates had advanced digital competencies or were experimented (combined 54% - 64%). *Conclusion*: The existing data does not allow us to fully analyse the medical and technological competencies learned during high-school. There are many nurse candidates at UMFT, which have received a baccalaureate degree in geography, but most candidates at UMFC and UMFB have the optional degree in anatomy. Future analysis could compare this group with candidates who have failed the entry exams or with candidates from other health faculties.

Keywords:
Education; Nursing

Consent model, opt-in/opt-out system, and organ donation rates in the European Union countries

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Abstract
Introduction: Disparities in organ donation rates exists through the world countries, even despite sharing a common legislative background. The model of the consent for organ donation after brain death (deceased donor) informed consent (opt-in system) or presumed consent (opt-out system), influences the rates of organ donation. Opt-out legislative systems claim to dramatically increase effective organ donation consent rates. There is no evidence that opt-out system is the sole factor. The aim of the study was to identify if other factors than opt-out system may interact and modify the system's effect on donation rates. *Materials and methods*: Secondary data analysis using the European annual reports from International Registry in Organ Donation and Transplantation (IRODaT) for the years 2013-2017 through univariate descriptive statistics was done. Comparisons were made between all 28 EU countries from the perspective of the consent systems. For this study, we choose to compare the donation rate per million population (pmp) between EU countries with opt-in consent system, 8 countries (28.58%) - Denmark, Netherlands, Germany, Romania, UK, Ireland, Lithuania, Malta - and countries with opt-out consent system, 20 countries (71.42%), namely Sweden, Poland, Austria, France, Spain, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Finland, Greece, Hungary, Italy, Latvia, Luxembourg, Portugal, Slovakia, and Slovenia. *Results*: In opt-out system countries resulted a mean value of 20.34±9.79 pmp, and in the opt-in countries resulted a mean value of 15.94±6.30 pmp. For each year we have analyzed, the mean for opt-out countries has recorded a higher value of pmp than opt-in countries: 2013 – 19.77/16.64, 2014 – 19.15/15.10, 2015 – 20.79/14.94, 2016 – 20.45/16.51, 2017 – 21.45/16.50. *Conclusion*: Opt-out consent may lead to an increase in deceased donation but it is also important to assess other factors that influence organ donation system.

Keywords:
Organ Donation Rate; Presumed Consent; Informed Consent

Analysis of antibiotic use in an intensive care unit of a county hospital

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Abstract

Introduction: National data on the consumption of antibiotics in hospital are relatively just a few, therefore a comparative analysis of this consumption is limited. In the conclusions of the Report on the use of antibiotics, bacterial resistance and infections associated with healthcare in Romania for the year 2016, the excessive consumption of antibiotics is specified and excessive. The probability that patients hospitalized to receive an antibiotic is very high. *Objectives*: Our study aim is to determine the antibiotics consumption in a ICU department of a county hospital for the first 4 months of the year 2019. *Materials and methods*: In order to attend our objective, our study design is retrospective and descriptive and we used observational statistical analysis, based on quantitative research, carried out at Emergency Clinical County Hospital of Oradea, during the first semester of the year 2019, using the hospital's IT system InfoWorld. *Results*: In the first quarter of 2019, a total antibiotic consumption has a value of 906770,27 RON (190,000 Euro). Most antibiotics are prescribed on the ICU department, representing approximately 46% of the total hospital consumption, followed by surgical departments (28.3%) and medical departments (25.7%). The evolution of antibiotic use is increasing in the first 4 months of the year on the ICU departments, while on the surgical and medical departments the consumption is fluctuating from one month to another. In the ICU departments antibiotic use in April increased by 40% compared to January 2019. Fluctuating consumption from one month to the next, on medical and surgical departments; a significant increase in April on the ICU departments. The implementation of antibiotic prophylaxis protocols in April led to a slight decrease in antibiotic use in surgical departments.

Keywords:

Antibiotic Consumption; Intensive Care Unit (ICU); Prophylaxis Protocols

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