



1st SPRING COLLOQUIUM SAPIS - 2024

Research and Innovation in Health Care.
The Contribution of the Technical Health
Professional of the Diagnostic, Rehabilitative
and of Prevention Areas

Florence, Italy

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Welcome to

1st SPRING COLLOQUIUM

SAPIS - 2024

The ongoing reforms in national healthcare services and a renewed focus on primary care and outpatient services have ignited a vigorous debate within the healthcare professions in recent years, after the worldwide healthcare crisis due to the Covid-19 pandemic. A greater attention is paid to the contributions by health professionals of the technical, rehabilitative, and of prevention areas in terms of values, competences, and trainings paths to this discourse. So, there is the growing imperative for these health professions to engage in research.

The Italian SAPIS Research Center (Studies and Action for Innovation in Healthcare), operated by the Italian National Federation of Orders of Diagnostic, Rehabilitative, and Preventive Technical Health Professionals (FNO TSRM & PSTRP) has provided a significant platform to gather and compare research experiences conducted by these professionals during the 1st SPRING COLLOQUIUM SAPIS – 2024, themed "Research

and Innovation in Healthcare: The Contribution of Technical Health Professionals in Diagnostic, Rehabilitative, and Preventive Areas" (May 9th and 10th, 2024 - Villa La Quiete, Via di Boldrone, 2, 50141- Florence).

Researchers have the opportunity to jointly discuss on the main area of interests (i.e., health management, training, multiprofessional approaches, best practice, innovation) to offer constructive ideas for reflection about the reform of Italian national healthcare service and European ones.

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Service management

IdentIRCCS. The identikit of workforce belonging to the Institution for Recovery and Care with a Scientific characteristics (IRCSS) S.Orsola in Bologna

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Bologna

Citation

Giusti M., Peghetti A., De Rosa M., Vetromile A., Durante S. IdentIRCCS. The identikit of workforce belonging to the Institution for Recovery and Care with a Scientific characteristics (IRCSS) S.Orsola in Bologna.

The current reform of the Italian National Healthcare System has been deeply changing the organizational asset of the health sector promoting from one side, the territorialization of the healthcare services' provision to be capillary as much as possible and, to the other side, the achievement of excellence. The primary care centers (district, GPs, consultancy clinic, "community house", and "community hospital"), the coordination centers (Territorial Operative Centrals, 116/117, 118) and the hospitals (hub & spoke) should synergically response, in an integrated way, to the low, moderate, and severe population health needs. In Italy Institutes of Hospitalization and Healthcare with Scientific Goal (called IRCSS) are recognized as the locomotives of research and innovation in the specific fields of actions, give a response where it is necessary an elective health intervention that requires the highest technological and/or organizational complexity or an experimental or a cutting-edge treatment. It is legitimate to think that the health professionals, who are working in IRCSS, are representants of health professional excellence within a context of technical and organizational excellence. Nevertheless, since no dedicated personnel selections and no specific criteria of employment have been still applied for the IRCSS, it is impossible to be sure on it for these reasons.

According with the current state-of-art, this research aimed the identification of the health professional profile who is working in an Italian IRCSS. To have this information is, in fact, useful for the adoption of effective personnel and company welfare policies.

The methodology was the case study. The IRCSS policlinics S.Orsola in Bologna was selected as significant case study because of the implementation the innovative "Assistance directorate" in 2024. This new structure flanks the general, administrative, health, and of the research directorates with the IRCSS to promote the adoption of innovative organizational models that will be able to favor the professional autonomies and to valorize the capacities of health professionals in giving effective responses to uncountable challenges to which the Italian NHS must managed. Pseudonymized data related to personnel were extracted from

the regional health personnel registry. Sociodemographic data (Age, Gender, Municipality of Birth, Municipalities of Residence, Municipality of Domicile), professional information (Professional Category, Role held, working hours, Received allowances, Contribution), and family/health-related details (Composition of the family unit, Number of children, Number of individuals with severe disabilities, Physical limitations) have been collected. The data were statistically processed to provide a description of the healthcare professionals' population at the IRCSS Polyclinic of Sant'Orsola.

The results highlighted that a thorough the collection and the analysis of socio-demographic variables (such as gender ratio and generational differences), contractual conditions (as percentages of type of employment, salary, job classification), and skill-mix (as high or low turnover or personnel coverage) facilitate evidence-based decision-making not only on the adoption or not of company welfare policies but also on the development of specific management strategies (such as whether to introduce skill-mix changes in response to staff shortages) due to direct correlation among the investigated variables.

Home radiology as effective response for the territorialization of public Italian health assistance

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Citation

Papi R., Sozzi S., Giusti P. Home radiology as effective response for the territorialization of public Italian health assistance.

The Ministerial Decree 77/2022 has outlined the key coordinates for reforming the Italian National Health Service. It proposes the decentralization of healthcare service delivery from hospital to local health facilities (for example primary health care centres or counselling centres) for prevent the disruption of diagnoses, assistance, and treatments experienced during the Covid-19 pandemic. While specific recommendations have been directed towards health assistance and treatment services, the attention to health diagnostic services has been somewhat overlooked.

The aim of this research was to assess the impact of organizational innovations in diagnostic services, aligning with the objectives outlined in DM 77/2022, with a specific emphasis on home radiology by professional perspective. It was decided to assess the impact from the professional perspective because of the possible internal resistance to the changing of complex organizations. Radiology services warrant attention due to their pivotal role as gatekeepers to clinical pathways for specific diseases offering a diagnosis.

The methodology employed was the case study approach. The local health authorities Toscana Sud Est and Toscana Centro were chosen as significant case studies due to the antithetic characteristics of the reference territories. The first includes extensive rural areas and only a few cities of moderate size. The second one, instead, is overlap with a metropolitan area of the Florence, the main regional city. In both contexts, the implementation of a home radiology service aims to provide a proximity response to the population, particularly for those who are more vulnerable.

The case studies were investigated through a desk analysis of data pertaining to the established home radiology services. This analysis encompassed the examination of protocols and procedures, types of examinations, dose reports, and feedback. These data were discussed with the involvement of health professionals in focus groups at the end of the 2023 to reveal the impact generated by the implementation of home radiology. From the focus group, the main advantages of implementing home radiology were identified as follows:

- Satisfaction in providing a tangible response to the frail population.
- Real integration between the hospital and local primary health care centres.
- Reduction of improper (or avoidable) admissions of patients on stretchers to the Emergency Room.

- Implementation of telemedicine and teleradiology.
- Humanization of care.
- New portable technology more efficient and effective of obsolete equipment in hospitals, resulting in no technical inconveniences or discomfort for users.
- Appreciation from users.

The impact generated by the introduction of home radiology service was extremely positive by professionals having contributed to enhancing the services offered by the radiology department of reference local health authorities. For this positive feedback home radiology will be expanded soon also to other areas of the case study, including disadvantaged regions with a high aging population.

Analysis and assessment of technical personnel needs for clinical laboratory: Activity based management as an evaluation methodology

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Citation

Bizzoni C., Napolitano G., Cesa S., Sacella L., Bianciardi C., Da Rin G. Analysis and assessment of technical personnel needs for clinical laboratory: Activity based management as an evaluation methodology.

Healthcare systems have to protect citizens' health by developing models combining concepts of efficiency, effectiveness and quality of care. The post-Covid-19 pandemic context has highlighted the relevance of efficiently managing and allocating human resources. In this scenario, the analysis and calculation of personnel needs take on strategic importance.

The project aims to suggest a methodology to define the needs of Biomedical Laboratory Technician Personnel (BLTP). The goal is to create a standard model adaptable to different contexts.

This project, developed in cooperation with the Italian Society of Clinical Biochemistry and Clinical Molecular Biology (SIBIOC), one of the most relevant Italian scientific societies of Laboratory Medicine, has created a new format following the “Activity Based Management” (ABM) approach characterized by continuous improvements, based on analysis of processes, broken down into sub-processes and activities. The working group was made up of doctors, biologists, biomedical laboratory technicians, and engineers to highlight how multi-professionalism is necessary in the actual healthcare context. Following the phase of format development, a phase of application to different contexts, including the biochemistry and the hematology sectors, belonging to the Corelab area of the SMEL-2 Complex Structure of the ASST Papa Giovanni XXIII in Bergamo (Italy), followed.

The suggested methodology allowed us to estimate the number of Full Time Equivalents (FTE) necessary for the management of the processes that characterize the above-mentioned sectors and to obtain objective and analytical data based on timely numerical surveys that included productivity and execution times of the different activities.

The filling format had a relevant impact on the analysis of the processes, their efficiency, and possible improvement. This method allowed us to evaluate and improve the analytical and “extra production” activities, the latter often underestimated but having a decisive role in the process. On the other hand, issues concerning data collection arose it was heavily time-consuming and not easy to understand, considering the detail of the format. Therefore, these issues highlighted the need to find the balance between an analytical format and a ready-to-use/fill one to obtain a uniform and reproducible interpretation in any laboratory context.

The proposed format can be considered a valid tool for laboratory managers to calculate technical staffing needs. The project is in the embryonic stage again, so there are broad prospects and plenty of room for improvement. It would be ideal to extend the methodology to other diagnostic disciplines of Laboratory Medicine and apply it to newly implemented activities.

Main Message

The use of ABM is suitable for analysing and evaluating the needs of technical personnel in the laboratory. ABM allowed us to obtain precise and objective data and, at the same time, to focus on the main objective of any clinical laboratory: to create value for the patient by supporting diagnosis and treatment of paths through safe and reliable laboratory tests, which depends on a correct allocation of human resources.

Proposal of organizational model's reform for the maximization of radiology department productivity.

A tuscan perspective

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Citation

Papi R., Giusti M. Proposal of organizational model's reform for the maximization of radiology department productivity. A tuscan perspective.

Next Generation EU (NGEU) has addressed the economic challenges posed by the COVID-19 pandemic in Europe. Italy has transposed the NGEU by mean of the Italian National Plan of Recovery and Resilience (PNRR). Mission 6 of PNRR has allocated €1.19 billion for the modernization of health technical equipment through the acquisition of 3,133 new technologies. The primary focus is on replacing middle-to-high complexity radiological technologies with more than 5 years of service.

The imminent availability of these technologies, expected by the end of 2024, underscores the need for prioritized identification and implementation of organizational and managerial actions.

These actions should program how to maximize the performance of radiology departments having these new resources.

This research aimed to identify the most effective organizational model for the optimization of productivity of the new radiological technologies that will be available in the next future thanks to the PNRR investments by the middle management perspective.

The used qualitative methodology for this research was a focus group with middle management of technical health professionals working in the South of Tuscany. This target group was chosen as significant case study due to the characteristics of the reference territory, which includes vast rural areas and only a few cities of medium size. In a similar context, the strategic placement and maximum utilization of radiological technologies will be crucial to ensuring the effective satisfaction of the population's health needs.

The case study was investigated through a desk analysis of productive data on the currently available diagnostic radiological technologies. This analysis considered executed examinations per technology and shift coverage for each technology. Both the medical and technical directors were actively involved in data collection. The same participated to the focus group to analyze the collected data.

The results revealed a concerning trend in the current productivity of technologies, predominantly utilized in the morning session and not consistently throughout the week due to a shortage of personnel, including both radiologists and radiographers. The presence of long waiting lists further exacerbated this issue due to the absence of organizational model that allowed the maximization of radiological technologies' productivity.

In focus group, health professionals recommended to limit the externalization of radiological examinations to private health facilities with an agreement under the Italian National Health Service (NHS) implementing health policies to prioritize direct provision of radiological examinations by public health services. From middle management perspective, the overcoming of the current personnel shortage will maximize the efficiency of the future technologies ensuring a reduction in waiting lists, enhancing the quality of health services in terms of diagnostic accuracy within integrated clinical pathways, and achieving increased performance in line with the objectives of Mission 6 within the National Recovery and Resilience Plan (PNRR).

Main Message

Middle management plays a crucial role in supporting the local health authority's top management by identifying potential actions for the reorganization of the radiology department in line with the goals of the PNRR, aiming to overcome the current critical issues.

Paediatric area

Beyond the Risks: Exploring the positive influence of social media on adolescent mental health in neurological and psychiatric contexts

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Citation

Frulli A., Uccella S., Siri L., Nobili L. Beyond the Risks: Exploring the positive influence of social media on adolescent mental health in neurological and psychiatric contexts.

The growing prevalence of digital technologies in the medical field has highlighted the importance of understanding their role in influencing

adolescent's mental health, especially when a neurological or psychiatric disorders co-exists. This literature review aims to comprehensively explore the potential benefits and positive effects of Social Media Use (SMU) among this vulnerable population.

While existing literature extensively discusses the negative effects of unsafe social media usage, there is a growing interest in exploring the positive aspects, as these have been highlighted after the social isolation enforced by the COVID-19 pandemic. This review aspires try to fill this gap knowledge by systematically examining studies on SMU among adolescents with or without neurological and psychiatric disorders, aiming to understand its impact on their well-being.

A systematic search will be conducted across major databases, including PubMed, PsycINFO, and Scopus, to identify relevant studies. Articles will be selected based on predefined inclusion criteria, and data extraction will focus on neurological and psychiatric disorders investigated, along with positive outcomes considered.

Initial findings suggest a wide range of studies investigating the association between SMU and the well-being of adolescents. However, there appears to be relatively fewer studies focusing specifically on adolescents with neurological or psychiatric disorders. Positive outcomes related to social media usage are emerging, alongside discussions on the integration of digital technologies into clinical care.

This study will analyze findings in the context of existing literature, highlighting key themes and implications for clinical practice and future research. Considerations will be given to the challenges and opportunities presented by SMU for enhancing the well-being and quality of life of this vulnerable population.

This review will offer an updated and in-depth overview of the role of social media and digital technologies in caring for adolescents with neurological

and psychiatric disorders. It is desired it will enforce the need for further research on clinical interventions to leverage the potential benefits of SMU and to while mitigate its risks.

Highlights

- Social Media Use (SMU) among adolescents with neurological and psychiatric disorders is an emerging area of research with both positive and negative implications.
- Understanding the impact of SMU on the well-being of these adolescents is crucial for informing clinical practice and future research endeavors.
- Integrating digital technologies into clinical care presents opportunities to enhance the quality of life for this vulnerable population.

Funding

Work supported by #NEXTGENERATIONEU (NGEU) and funded by the Ministry of University and Research (MUR), National Recovery and Resilience Plan (NRRP), project MNESYS (PE0000006) – A Multiscale integrated approach to the study of the nervous system in health and disease (DN. 1553 11.10.2022)

Urban household food insecurity and malnutrition in pediatric age: Evidences from the Luanda Divina Providencia Hospital

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Citation

Scimone Carbone A., Roscioli F., Mazziotta M. Urban household food insecurity and malnutrition in pediatric age: Evidences from the Luanda Divina Providencia Hospital.

Food insecurity is driven by the lack of institutions, and it affects the well-being of families by limiting access to food and increasing the risk of malnutrition in children. Analyzing primary and secondary data from the Divina Providencia Hospital of Luanda, Angola, this article investigates first the major deprivations related to household food consumption in a peri-urban area of the city, by deepening into the drivers that connect poverty, food insecurity, and malnutrition in children. Secondly, it investigates the extent to which acute malnutrition is associated with the rate of hospitalization. Through a non-parametric approach, we draw inspiration from Amartya Sen's capability approach for food security assessments. Applying CART (Classification and Regression Trees) analysis, we find that

lack of capabilities such as unsafe cooking methods, water inaccessibility, and low mother education undermine food and nutritional security fostering the cycle of disease-malnutrition. On the other hand, during hospitalization, anthropometry at admission, and the presence of edema influence the recovery time and the rate of lethality of malnourished children. Better policy design and implementation are needed to overcome immediate food crisis and long-term intergenerational transmission of poverty.

Development of an Oral Dyspraxia and Childhood Apraxia of Speech screening questionnaire

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Citation

Petillo C., Ferrarello F., Barsotti J., Salvadorini R., Nenciol R.i, Biagini I. Development of an Oral Dyspraxia and Childhood Apraxia of Speech screening questionnaire.

The diagnosis of Developmental Verbal Dyspraxia is often associated with a motor planning disorder of the oral region. The disorder has a negative impact on language development, as well as on nutritional and emotional development. Children with Developmental Verbal Dyspraxia also showed a slow response to traditional speech therapy treatment, highlighting the need for an early intervention.

We aimed to develop and test a brief questionnaire for the early identification of children with Oral Dyspraxia (OD) and Childhood Apraxia of Speech (CAS).

As the diagnosis of OD and CAS is complex and still controversial, it would be necessary to design a detailed tool in order to intervene in a timely manner.

We developed a questionnaire for the detection of signs of oral dyspraxia and verbal dyspraxia with a multistep development method. We performed literature review and synthesis and conducted a focus group. We drafted the questionnaire and, to determine how potential respondents would interpret the items, conducted cognitive interviewing (cognitive interviews average duration in seconds, 672.22 (SD 164.48); 95%CI 607.15-737.29). Subsequently, the items were reviewed by a group of experts and the questionnaire was administered to a sample of parents of 27 children aged 18-60 months (males, 13; females, 14; average age in months 37.4 (SD 11.7)). Six of the children had a history of language delay, and four had a clear diagnosis of language disorder. The mean time to complete the questionnaire was 148.37 seconds (SD 46.92; 95%CI 129.80-166.93). The internal consistency and reliability of the questionnaire were subsequently analyzed.

The observed Cronenbach's alpha was 0.175 for the oral dyspraxia section and 0.788 for the verbal section. The intraclass correlation coefficient was 0.760 (95%CI, 0.656-0.836).

Our preliminary results showed that the internal consistency was very low for the oral dyspraxia section and high for the verbal dyspraxia section. The low internal consistency found for the oral dyspraxia section could be due to absence of defined diagnostic criteria, and the small sample size. The test-retest reliability results meet the stability criteria of the instrument. Parents of children with a specific language disorder diagnosis gave significantly different answers to questions 10 and 15 ("Is your child taciturn (for example, he uses little verbal language if he has to communicate something to you)?" and "Does your child have greater difficulty producing longer words such as "dinosaur" by significantly modifying the sounds within the word (e.g. titotaulus)?")

These items could probably be sensitive to the presence of language disorders.

Our study lays the foundations for the development of a valid and reliable tool for early diagnosis of OD and CAS. Further development studies conducted in larger samples and leading to complete the psychometric testing, are needed before the instrument can be used in clinical practice.

Vulnerable people

Association of functional vision and orthoptic testing with high resolution oct findings in patient with neurodegenerative disorders

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Citation

Biagini I., Ponticelli F., Santoro F., Lenzetti C., Virgili G. Association of functional vision and orthoptic testing with high resolution oct findings in patient with neurodegenerative disorders.

Neurological diseases, such as Multiple Sclerosis (MS), pose significant diagnostic and management challenges. Identifying reliable biomarkers and developing effective methods for monitoring treatment responses are critical for improving patient outcomes.

MS is an autoimmune condition primarily affecting the central nervous system, leading to inflammation and damage to the nervous tissue. It is a complex disease influenced by various genetic and environmental factors, with an onset typically between the ages of 15 and 45, more commonly affecting females. Given the complexity of MS, it is crucial to identify reliable biomarkers for early diagnosis and effective treatment monitoring. This project aims to explore the associations between clinical, retinal imaging, and functional vision testing in patients with neurological diseases, focusing on Multiple Sclerosis (MS). Patients referred from the Neurology Department to the Eye Clinic at AOU Careggi, Florence, Italy, between October 2022 and June 2023 were evaluated using functional tests.

All patients underwent neurological evaluations, with MRI using T2 FLAIR sequences performed by an experienced neurologist. MRI assessed white matter lesions (WML) in the central nervous system. Patients were categorized based on the presence of the central vein sign (CVS) in more or less than 50% of perivenular lesions (PVLs). We performed Functional Testing, like Visual Field Testing, Contrast Sensitivity, Color Vision: and Visual Evoked Potential (VEP)

A total of 27 patients (54 eyes) were evaluated in the study. In the MS group (defined as Typical), nine patients exhibited typical clinical features of MS. In the MS-plus group, 18 patients met specific criteria, with 10 in MS+0 (less than 50% PVLs) and eight in MS+1 (more than 50% PVLs). Notably, patients with a history of monolateral optic neuritis were included in both groups. A comparison of patients with and without prior Optic Neuritis (ON) manifestations revealed no significant differences in the visual parameters.

Color Vision

The study found a prevalent Tritan deficit in all three MS groups, with no significant differences in the number of missed plates for each type of color vision defect.

Contrast Sensitivity

Patients in the MS+0 group (less than 50% CVS in WML) showed worse contrast sensitivity on all spatial frequencies compared to MS+1 and MS Typical, although the differences were not clinically significant.

Visual Field

The MS+0 group exhibited worse MD and PSD values compared to MS+1 and MS Typical. However, the correlation was not statistically significant, except for a borderline trend in PSD values.

Visual Evoked Potential

The results showed no significant difference between ON and NON eyes, with small sample sizes limiting the analysis. Amplitude and latency variations in VEPs were observed, but their clinical significance was unclear. A comparison of the three MS groups indicated no significant differences in visual functional parameters. However, the small sample size of the MS+0 group could potentially affect the statistical significance of the results. This preliminary research suggests that certain trends exist within these functional tests, although the sample size was limited. The study found color vision deficits, with a prevalent Tritan deficiency among the tested patients. Contrast sensitivity appeared to be worse in patients with less than 50% central vein sign in their WML, although the differences were not statistically significant.

Visual field parameters were more affected in the MS+0 group than in the MS+1 and MS groups, but once again, statistical significance was not achieved. Visual Evoked Potentials showed variations in amplitude and latency, but clinical significance remained unclear.

Further investigations with larger sample sizes and more comprehensive data collection are needed to confirm and extend these findings.

The effectiveness of a medical filter as a treatment for glare in patients with glaucoma

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Citation

Piepoli M., Biagini I., Falchini E., Di Pietro S., Di Simone A., Bartolomei F. The effectiveness of a medical filter as a treatment for glare in patients with glaucoma.

Glaucoma is a progressive optic neuropathy characterized by damage to the optic nerve, leading to vision loss and potential blindness if left untreated. One common symptom experienced by glaucoma patients is glare, which can significantly impact their quality of life. Various strategies, including the use of medical filters, have been proposed to mitigate glare and improve the quality of life for glaucomatous patients. These filters aim to selectively block specific wavelengths of light, reducing dazzling and improving visual comfort. However, the effectiveness of different filters in real-world settings,

particularly in the context of low-vision rehabilitation services, remains uncertain.

To evaluate the quality of life of glaucoma patients with glare and to determine the most effective medical filter to reduce glare among patients registered in the Devices and Aids Registry (DARe) from various low-vision rehabilitation services in Italy.

We quantified the number of glaucoma patients using or prescribed a medical filter, determined the most used or prescribed wavelength, and evaluated potential differences in the Instrumental Activities of Daily Living (IADL) questionnaire scores between patients who use filters and those who do not. We focused particularly on questions concerning orientation and mobility ability. We then correlated the reduction in contrast sensitivity with field reduction.

Our analysis included 253 patients, of whom only 21 reported using filters and 38 were prescribed filters. Filter use did not significantly change the mean IADL score (3.5362 for patients with a filter, 3.9626 for patients without a filter). In addition, no significant difference were found between the two groups in responses related to orientation and mobility, which were mostly comparable. Surprisingly, the most commonly used filter in glaucoma patients was 450 nm (37.9%), while only 2% preferred class II filters (i.e., between 500-540 nm). Analysis of the correlation between field reduction and contrast reduction did not show a strong correlation, which is slightly different from the literature. Instead, patients with glare experienced a greater reduction in contrast sensitivity, consistence with current knowledge.

We observed greater efficacy of the 450 nm filter compared to previous reports. However, the filter alone does not appear to be sufficient to improve the independence of glaucoma patient, as they have a similar level of quality of life as those who do not use filters. Glare and contrast sensitivity reduction are closely related according to the current state of the art.

Importance of multidisciplinary treatment of the patient with tinnitus: The perspective of the hearing aid technician

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Citation

Morabito F., Bagnato A., Samperi C., Scimone M., Caminiti D., Maini E.S. Importance of multidisciplinary treatment of the patient with tinnitus: The perspective of the hearing aid technician.

The objective of the work is twofold: firstly, we want to underline the crucial importance of working within a multidisciplinary and interprofessional team for the treatment of patients with tinnitus; secondly, we want to provide the perspective of the hearing aid technician for the treatment of patients that apply for Tinnitus Retraining Therapy (TRT).

Frequently, especially at the onset of the symptom, the patient with tinnitus resorts to the ENT specialist, effectively identifying this specialist as the only reference figure who can guide him in the therapeutic path. Tinnitus,

however, is a symptom whose etiology is multifactorial; therefore, a correct diagnostic-therapeutic path must be multi-professional and interdisciplinary.

The initial resort to the ENT specialist therefore places the patient at the initial step of an “inverted pyramid” which, will tend to expand - in number and specialization - the healthcare figures throughout the diagnostic-therapeutic path. Among these figures, a very important player is the hearing aid technician who has to translate the indications emerging from all the team members into technical terms with the aim of fitting the sound generators to the specific needs of each patient.

In this work we will present the data collected by our team between 2013 and 2023. The team is made up of: ENT, Cardiologist, Radiologist, Gnathologist, Audiologist, Biomedical Engineer, Psychotherapist, Osteopath and Nutritionist.

The sample presented in the work consists of 198 patients.

The inclusion criteria adopted for the selection of the sample are:

1. Tinnitus treated with TRT
2. Having completed the follow-up protocol adopted by the team

However, all patients who did not receive an indication for TRT treatment despite resorting to treatments of another nature (i.e. pharmacological, osteopathic, gnathological, etc.) were excluded from the results of this study as the role of the audiologist in such treatments is marginal.

In accordance with the protocol developed by the team, the effectiveness of TRT was quantified using the THI questionnaire administered at the time of candidacy and subsequently 15, 30, 90 and 180 days after the start of the therapeutic treatment. The statistical analyses of the results obtained were conducted through the so-called “within design” using the repeated measures ANOVA model.

In the sample of this study, we verified that the symptomatic manifestation of tinnitus was reduced in a statistically significant manner ($p < 0.01$).

In the first 30 days, the THI was reduced by 30% and at the end of the treatment its scores were never higher than 15% of the initial score. More details concerning data analysis and results will be presented in the complete work.

In this abstract we would like to underline that the data collected on a significant sample and the analysis of the individual clinical-rehabilitative developments lead to identify the multidisciplinary and interprofessional approach as a primary need.

Indeed, based on the clinical observations of the treated patients, we observed that the collaboration of multiple professionals on each case leads to results that are largely more satisfactory, facilitates the patient's approach to the therapeutic path and offers a variety of scientific options that are impossible to achieve in multiple rehabilitation offers when diversified in times and methods of intervention.

In such an intervention framework, the figure of the Hearing Aid Technician takes on a very important role. In fact, by observing the rehabilitation process of TRT, it may be clear that the hearing aid technician intervenes by establishing the necessary "covalent link" between a careful evaluation of the results of the THI and a specific design of the most correct strategy for regulating the sound generator.

Elderly

Comprehension of idioms, metaphores and proverbs in early dementia

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Citation

Dellai A., Biddau F., Gollin D., Codemo A., Sanfelici E., Gabelli C. Comprehension of idioms, metaphores and proverbs in early dementia.

While previous studies focusing on nonliteral language have mainly concentrated on subjects affected by Alzheimer Disease (AD), little is known on other types of dementia. In addition, theoretical studies have convincingly shown that nonliteral expressions have different syntactic,

semantic and pragmatic properties. However, the comprehension of each nonliteral expression is still poorly investigated. This study investigates the comprehension of figurative language (i.e. idioms, metaphors, and proverbs) in participants affected by cognitive decline and dementia. This paper aims at understanding how patients affected by mild cognitive decline and dementia.

14 participants with mild cognitive decline and dementia: 6 affected by Mild Cognitive Impairment (MCI), 4 by behavioral variant Fronto-Temporal Disease (bv-FTD), 4 by AD who affected by MCI, 4 bvFTD; 4 AD) were tested with "Figurative Language 2" from Assessment of Pragmatic Abilities and Cognitive Substrates (Test APACS).

The task consists of 15 items: proverbs (5), idioms (5) and metaphors (5). Data were statistically analyzed with a non-parametric comparison test (Wilcoxon test). We calculated whether the distribution of responses (0/1/2) depended on the type of nonliteral expression (idioms/metaphors/proverbs) and on the polarity of the sentence (affirmative/negative). We further asked whether the distribution of responses differed with respect to the diagnosis.

The test revealed a significant effect of the type of nonliteral expression. The explanation of proverbs was worse than the explanation of idioms (p value = 3.2×10^{-10}) and of metaphors (p value = 2.5×10^{-6}). Likewise, a significant effect of polarity was detected. Affirmative sentences were explained better than negative ones (p value = 3.4×10^{-8}). AD patients gave more wrong responses than the other patients. In turn, incomplete explanation characterized the responses by bvFTD and MCI patients.

Our results show that patients affected by mild cognitive decline and dementia face difficulties in comprehending proverbs and negative sentences. Whether the source of the difficulty is the structure of proverbs per se or rather the presence of a sentential negation it needs to be investigated in future research. In addition, we found a difference between the three types of dementia investigated in the type of responses provided. Since our dataset consisted of a small number of participants, future research is needed to prove this tendency.

Virtual reality cognitive remediation tool for individuals with mild cognitive impairment: Study protocol for a feasibility randomized clinical trial

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Citation

Perra A., Carta M.G., Primavera D., Leonetti V., Montisci R., Chessa L., Scuteri A., Cossu G., Nardi A.E., Locci A., Valmaggia L., Galetti A., De Lorenzo V., Sancassiani F. Virtual reality cognitive remediation tool for individuals with mild cognitive impairment: Study protocol for a feasibility randomized clinical trial.

With the growing elderly population, the European Union emphasizes the need to promote research in active aging through multidisciplinary and innovative approaches, including the integration of advanced technologies like virtual reality in cognitive rehabilitation. This reflects the increasing awareness of the importance of addressing challenges related to neurodegenerative diseases in the elderly population. Our study aims to present a protocol that will assess the feasibility and provide a preliminary measure of effectiveness for an intervention using immersive virtual reality (VR) technology for cognitive remediation (CR) in individuals with Mild Cognitive Impairment (MCI).

A feasibility randomized controlled clinical study will involve 30 individuals who are over 65 years old, both sex, who meet the diagnostic criteria for MCI from the University Hospital of Cagliari, randomly assigned to either the experimental condition or control group. Both groups will continue to receive standard pharmacological therapy. The experimental group will undergo a 3- months cognitive remediation program using fully immersive VR with two sessions per week. Each session will last a maximum of sixty minutes and will be supervised by expert health professionals. In contrast, the control group will continue with standard care. The intervention program

will involve speech therapists and psychiatric rehabilitation technicians, emphasizing a comprehensive framework aligned with healthcare needs.

Feasibility will be assessed based on tolerability, including dropout rates and acceptability, which considers the proportion of recruited participants among those considered eligible and side effects. The preliminary measures of effectiveness will be evaluated on quality of life, cognitive functions, biological and social rhythms, depressive symptoms and anxiety.

The trial findings will be submitted for publication in international peer-reviewed journals and shared at international meetings and conferences.

This study aiming to assess the feasibility and preliminary effectiveness of a fully immersive VR/CR program for MCI in order to give data for a subsequent confirmatory trial.

The results of the pilot RCT are expected to significantly contribute to research on the prevention of neurocognitive degeneration, with a specific emphasis on enhancing the application of technologies.

Main Message

The strengths of this work is the high technological innovation program for mental health treatments for active ageing and multidisciplinary approach emphasizing a holistic framework aligned with health needs.

Preserved structural priming in people with mild cognitive impairment and dementia

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Citation

Biddau F. Preserved structural priming in people with mild cognitive impairment and dementia.

Structural priming in language production is the tendency for speakers to re-use the abstract syntactic structure of a previously processed prime sentence. The effect is long lasting and does not decrease in magnitude when intervening distractor trials separate the prime sentence and the target picture. It has been proposed that the memory system that supports priming is implicit memory for syntax. Consistent with this hypothesis, structural priming has been found in anterograde amnesia and Korsakof 's syndrome.

The present study is the first one to examine whether structural priming is also intact in speakers with mild dementia, using a temporal lag (2 fillers) between prime and target.

Ten adult native speakers of Italian (age $M = 69$, range 55-75 years old) participated in the study. Five participants were diagnosed with Alzheimer Disease (AD), two with fronto temporal dementia (FTD), one with Lewy Body dementia (LBD), one with Parkinson's Disease (PD) and one with Mild

cognitive Impairment (MCI). The priming task involved hearing and repeating an auditorily presented sentence and then describing a picture of a transitive event with an agent and a patient. Prime structure was transitive (active, passive). 2 filler trials separated prime and target. As recommended in the priming literature, statistical analyses were performed using mixed logistic models.

We found a main effect of prime structure that indicates that speakers were more likely to use a passive sentence when primed with a passive two trials earlier, than when primed with an active.

The finding that structural priming persists over two filler trials in participants with cognitive decline and dementia is novel. The priming effect was comparable in magnitude to that found by Heiseler et al. at lag 0 in Korsakoff patients.

Our results are consistent with an implicit memory and implicit learning account of structural priming. The study also suggests that structural priming is a useful technique to determine linguistic stimulability at the level of complex syntax (passives) and to tap into preserved cognitive functions.

Main Message

The result shows that structural priming is intact in people with mild dementia. It also opens the possibility of using priming in rehabilitation.

Professional perspective

Effectiveness of trigger point treatment techniques for foot pathologies: A scoping review

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Citation

Tedeschi R. Effectiveness of trigger point treatment techniques for foot pathologies: A scoping review.

Foot pathologies, such as plantar fasciitis, Morton's neuroma, and arthritis, significantly impact patients' quality of life, causing pain and limited mobility. Among various treatment options, trigger point therapy, including manual techniques and dry needling, has gained attention. Trigger points, hypersensitive muscle knots, have been associated with musculoskeletal disorders and may offer relief for foot conditions. This comprehensive scoping review explores the clinical application of trigger point treatment techniques for foot pathologies.

Despite growing interest in trigger point therapy, a comprehensive assessment of its efficacy and clinical implications in foot pathologies

is lacking. This study aims to fill this knowledge gap by examining the effectiveness of trigger point treatments in terms of pain reduction, improved functionality, and enhanced quality of life for patients with foot disorders.

Following the JBI methodology and PRISMA-ScR checklist, we conducted a literature search across multiple databases and grey literature sources. Eligible studies included randomized clinical trials (RCTs) that evaluated manual trigger point therapy and dry needling for various foot pathologies. A total of seven studies met the inclusion criteria.

The scoping review identified seven relevant studies, which assessed various trigger point treatment techniques for foot pathologies. Findings demonstrated that trigger point therapy, including dry needling, dry cupping, and local heating, consistently led to significant pain reduction and improved functionality in patients. Combination therapies, such as extracorporeal shock wave therapy (ESWT) and dry needling, showed promising results. Treadmill exercise following dry needling also enhanced motor function recovery in patients with surgical ankle fractures.

Despite the positive outcomes observed, limitations, including small sample sizes and short follow-up periods, were noted in the included studies. Further research with larger samples and longer-term assessments is warranted. Healthcare professionals should consider trigger point treatment techniques as part of a comprehensive approach for managing foot pathologies, always tailored to individual patient needs.

In conclusion, trigger point treatment techniques, including dry needling, dry cupping, and local heating, offer promising options for managing foot pathologies, leading to significant pain reduction and improved functionality. These techniques should be considered in the holistic management of foot disorders, with careful attention to individual patient characteristics and preferences.

Highlights

1. Trigger point therapy can effectively reduce pain and enhance functionality in patients with foot pathologies.
2. Combination therapies, like ESWT and dry needling, show promise for improving outcomes.
3. Larger-scale and longer-term studies are needed to strengthen the evidence base for these interventions.

Pilot project aimed to creation of multimedia format diet plans for the nutritional management of S.I.A.N patients of the Noventa Vic.na Hospital: From the project idea to the case-control study

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Citation

Rossetini A., Toniolo A., Pavan P. Pilot project aimed to creation of multimedia format diet plans for the nutritional management of S.I.A.N patients of the Noventa Vic.na Hospital: From the project idea to the case-control study.

Nowadays it is essential to implement new communication methods also in the nutritional field, in order to facilitate the understanding of dietary plans, the acquisition of adequate lifestyles and weight loss in those who need it. Specifically, dietary and nutritional advice should be provided as comprehensively as possible, with the aim of facilitating adherence to a correct food model and avoiding the risk of chronic non-communicable

diseases (NCDs). The need to identify a more accessible and technological method is at the basis of the implementation of the pilot project aimed at the creation of n. 17 dietary schemes in multimedia format with relative recipes, issued to patients of the S.I.A.N (AULSS n. 8 Berica) nutritional clinic at the Noventa Vicentina Hospital.

The multimedia support was created with Movavi Video Suite 2021 program and then released to each patient via Google Drive, between 17th November 2021 and 22nd July 2022. The level of satisfaction for this support was investigated with paper questionnaires and weight loss following watching the videos was investigated through a case-control study with 25 patients between 22nd April 2022 and 22nd July 2022 (inclusion criteria: BMI ≥ 25 Kg/m², average score on the questionnaire ≥ 4 , BMI range/age range/gender comparable to previous year's patients).

The questionnaires delivered manually were 313, of which 136 were compiled. The most involved gender was female (59.1%), with an age range between 50-65 years (42.4%), BMI range of 25-30 Kg/m²(37.1%), educational qualification corresponding to the high school diploma (44.7%), Italian nationality (100%). In terms of liking, the average rating was 4.5 (Likert scale of 0 to 5).

The mean weight loss in patients with the multimedia format diet plan was 5 kg (5.6%) and 1.5 BMI points.

The results in terms of liking and weight loss have been promising, but further studies are required to consider the highlighted limits.

The comparison of regional governance models of MEIR risk management in Italy

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Citation

Giusti M., Persiani N. The comparison of regional governance models of MEIR risk management in Italy.

European Union enacted the European Directive 2013/59/Euratom for addressing the risk management of the medical exposure to ionising radiation (MEIR) defining a common theoretical governance model among member States for the establishment of uniform basic safety standards (BSS) against the dangers arising from ionising radiation.

Faced with the knowledge gaps concerning national transpositions, this research aimed to investigate the regional governance models of MEIR risk management in Italy.

The cross-case analysis was adopted as the most effective methodology that allowed to compare the different regional governance model of risk management related to MEIR implemented in Italy. Veneto, Tuscany, and Sardinia were selected as representative case studies of North, Centre, and South of Italy.

Veneto have set a consolidated MEIR risk management model continuously updated to the latest ongoing regulations (2000-2022), well organized

because of the clear attribution of roles and responsibilities among the different involved regional actors. Tuscany has indeed had a dated model for MEIR risk management since 2003; it must be updated at the latest regulations and simplified due to the duplication of intricate functions at regional level. At the end, Sardinia recently has introduced a new MEIR risk management model (2020) that is establishing so it cannot be still judged. All considered regions have presented a centralized organization with a political side deputed to the coordination of MEIR risk management at regional levels and a technical one of connection with the national level represented by the competent authority for MEIR at the Ministry of Health.

The three regions taken as examples have three completely different organizations for inspection and monitoring activities, reflecting the absolute regional variability in the implementation of national legislation transposition with law number 101/2020. This is the starting point for the detailed description of the Italian governance model for MEIR risk management to be compared with the other Europeans.

Main Message

The comparison of the European Directive 213/59/Euratom's Italian transposition with the other European risk management MEIR models is possible only starting from the investigation and the integration of Italian regional models.

Experience on COVID-19 as a new research approach involving health technicians in emerging infectious diseases

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Citation

Tempestilli, M., Vanini, V., Verardo, R.A., Butera, O., Longo, N.R., Ciaralli, C. Experience on COVID-19 as a new research approach involving health technicians in emerging infectious diseases.

Several healthcare figures have been involved in the global health emergency caused by COVID-19 pandemic. Health technicians had a key role in the management of both diagnostic and research activities. From an epidemiological, radiological, physiopathological, and therapeutic perspective, COVID-19 was an unknown pathology.

The aim was to involve the unit "Professioni Sanitarie Tecniche" (PST) of the National Institute for Infectious Diseases (INMI) "L. Spallanzani" IRCCS in the research projects on COVID-19 in order to:

- a) characterize the virus
- b) assess the radiation dose exposure in thoracic computed tomography
- c) study the specific T-cell immune response
- d) evaluate cardiac damage
- e) evaluate the clinical pharmacology of the antivirals used to treat the disease

Specialized technicians (PST staff) with high research skills acquired over the years, contributed with their experience in several projects. Technologies of high complexity have been used, such as:

- a) whole genome sequencing (WGS) on NGS platforms for virus analysis
- b) analysis, monitoring and collection of radiological data via Dose Watch
- c) ELISA/Luminex tests for the evaluation of new immune biomarkers
- d) histology and molecular studies applied to demonstrate heart failure
- e) liquid chromatography combined with mass spectrometry for clinical pharmacology studies

The PST staff actively participated in the statistical analysis of the results and the preparation of scientific international papers.

Multidisciplinary collaborations allowed to:

- a) identify the trend of circulating variants in the different phases of the pandemic
- b) radiologically compare COVID-19 with other lung diseases
- c) highlight the role of the cytokine storm in COVID-19
- d) demonstrate the immune-mediated role on cardiac damage in COVID-19 patients
- e) increase knowledge on antiviral treatment

A highly qualified PST staff, in collaboration with others healthcare figures, was able to support and manage research projects, producing new data on epidemiology, physiopathology and treatment of an emerging infectious disease as COVID-19 from the early stages of the disease to the studies on vaccines.

Health research expertise applied to COVID-19 of the PST staff have allowed an interprofessional and interdisciplinary approach in the international scientific production of the INMI. The same multidisciplinary approach proved to be effective for research conducted during the recent Monkeypox epidemic.

Main Message

An effective organizational response of highly specialized health technicians will allow us to quickly address new infectious health emergencies from both diagnostic and research point of view.

The contribution of the FNO TSRM and PSTRP to the implementation of the PNRR's Mission 6 "Health"

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Citation

Giusti, M., Beux, A., Calandra, T., Greco, G., Persiani, N. The contribution of the FNO TSRM and PSTRP to the implementation of the PNRR's Mission 6 "Health".

In 2021, the PNRR identified the pillars upon which to build Italy's economic recovery post COVID-19 pandemic. In PNRR's Mission 6 "Health", guidelines for the reform of the Italian NHS were specifically outlined, namely its territorialization and digitalization. The implementation of such ambitious

reform has aimed to dismantle the hospital-centric organization of the Italian NHS and promote integrated care by multi professional teams. In absence of institutional working groups, where all healthcare professions could contribute to the operational implementation of the PNRR, FNO TSRM & PSTP felt the need to conduct a study aimed at gathering contributions from the 19 represented professions. The objective of this work was to identify common points of interest to offer an integrated contribution from the health professionals belonging to FNO TSRM & PSTP to the ongoing discussion. The qualitative methodology was the focus group. At the request of the FNO TSRM & PSTP, national boards of 19 health professionals belonging to FNO TSRM & PSTP submitted a positioning document identifying the common conceptual starting points and operational proposals on how each profession could effectively contribute to the reform of the Italian NHS.

The received material was collected by research group and discussed in four distinct multi professional working group composed by 8 representants of health professions who were involved in focus groups. Two focus groups were conducted to identify the main points of interest by health professional and work on joint operative proposals. The last focus group was aimed to validate the main ten shared points of interest by all participants, as follows:

1. Qualification and specialization of Hospitals, particularly University Hospitals and IRCCS, in managing diagnostic, therapeutic, and care complexity through appropriate use and allocation of high technology.
2. From division to sharing.
3. Health protection, environment, climate, and sustainability as guiding principles.
4. Enhance prevention activities, both individual and collective, in living and working contexts.
5. Enhance multi professional teams within the rethinking of the PPDTA system.

6. Strengthen digital innovation and territorial and home telemedicine.
7. Update of Essential Levels of Assistance and streamlining of care pathways.
8. Investment in university education and the quality of professions.
9. Managerial training and continuous education.
10. Enhancement of Research as a tool for the growth of the NHS and its professionals.

These formed the first part of the FNO TSRM PSTRP's policy paper "Implementation Proposals of PNRR. The contribution of the 19 health professions belonging to FNO TSRM & PSTRP", explaining the vision of the new Italian NHS by the FNO TSRM and PSTRP. The 27 projects proposed by the national boards were instead the body of the document relating to the implementation of PNRR's Mission 6 "Health".

FNO TSRM & PSTP was so able to effectively contribute to the establishment of the PNRR's Mission 6 "Health" reporting the point of view and the suggestions of the represented 19 health professions in official headquarters of the Italian Ministry of Health.

Vascular interventions

Early results of a randomized trial on the use of 3d-printed models for endovascular planning and simulation in patients undergoing peripheral angioplasty

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Citation

Martini, C., Perini, P., Foresti, R., Bianchini, C., Mersanne, A., Freyrie, A. Early results of a randomized trial on the use of 3d-printed models for endovascular planning and simulation in patients undergoing peripheral angioplasty.

Precise preoperative planning for peripheral artery diseases (PAD) endovascular treatments (EVT) is vital to avoid complications. Current EVT planning relies on preoperative Computed Tomography Angiography (CTA) or in-procedure digital subtraction angiography (DSA). Recent literature suggests 3D printing can enhance preoperative planning in surgery.

This study reports early results from a single-center, single-blind, randomized controlled trial on the impact of 3D-printed models on EVT outcomes for PAD. The primary aim is to assess if using custom 3D-printed models for preoperative planning yields significant operative advantages.

Methods

The study, from January 2022 to December 2023, included PAD patients needing EVT for aorto-iliac-femoral-popliteal lesions. Patients were randomized into two groups: 3D-group using custom 3D models, and standard group with conventional procedures. Urgent cases were excluded. OsiriX MD and Blender were used to create 3D models, printed as in-house custom-made class I medical devices. Data included operating time, contrast volume, fluoroscopy time, radiation dose, technical success, and complications.

Seventy-three patients were randomized (36 in 3D-group, 37 in standard-group). Mean age was 71.5 ± 9.7 years, with 77.1% males. Both groups showed homogeneity in demographic and PAD characteristics. 3D-group had significantly reduced mean operating time (60.6 ± 26.5 vs. 108.8 ± 77.2 minutes, $P = .001$). Contrast volume, radiation dose, and fluoroscopy time had no significant differences ($P = .65$, $P = .74$, $P = .06$). Technical success was higher in 3D-group (94.5% vs. 78.4%, $P = .04$). Intraoperative complications occurred in 16.7% of 3D-group and 24.3% of standard-group ($P = .41$).

Simulation-based training positively impacts surgical learning. 3D printing, providing cost-effective customizable models, shows promise in medicine. Preliminary findings suggest preoperative planning with 3D-printed models may significantly reduce operation time and enhance technical success.

Preliminary findings support the potential advantages of using custom 3D-printed models in preoperative planning for EVT in PAD. Reduced operation time and improved technical success in the 3D-group warrant further investigation with a larger patient cohort. While promising, additional studies are needed to validate these findings and explore broader implications of 3D printing in vascular surgery.

Highlights

- Custom 3D models in preoperative planning may improve endovascular treatment outcomes for peripheral artery disease.
- 3D printing technology facilitates personalized anatomical models, enhancing surgical simulation and training.

Convolutional neural networks for automatic reclassification of arrhythmias detected through the Ritmia single-lead ECG wearable device

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Citation

Martini, C., Pecori, R., Gaibazzi, N., Demeco, A., Costantino, C., Cagnoni, S. Convolutional neural networks for automatic reclassification of arrhythmias detected through the Ritmia single-lead ECG wearable device.

Wearable technologies, like Ritmia, democratize long-term cardiac monitoring, offering cost-effective solutions with high sensitivity for detecting sporadic arrhythmias. Ritmia, equipped with ECG capabilities and worn as a chest belt/adhesive patch, uses patented algorithms to automatically record ECG strips upon detecting arrhythmias based on RR

interval irregularity. Despite high sensitivity to RR interval irregularity, it lacks specificity, causing possible false recordings due to electrical artifacts, especially during activities like sports. A preliminary study incorporating a simple convolutional neural network (CNN) downstream of Ritmia demonstrates promising results in reducing possible false arrhythmia recordings by the device.

To evaluate whether a neural network can reduce the misleading recording of electrical artifacts erroneously interpreted by the device as arrhythmias.

Healthy volunteers wore Ritmia (<http://www.heartsentinel.net>) during their daily activities in sessions at least 12 hours long. We collected the ECG time series that Ritmia had detected as arrhythmic. A cardiologist classified ECG tracks as true positives (arrhythmias) or false positives (electrical artifacts during normal sinus rhythm) to train a custom CNN and improve accuracy compared to the device's initial interval-variance-based labeling. Training, testing, and validation included 50%, 30%, and 20% of the ECGs. The CNN structure included three blocks with convolutional and pooling layers, down sampling the sequence from 750 to 94 samples, two dense layers of size 128 and 64, and a single neuron as output.

Overall, out of 1052 6-second-long ECG strips (falsely or truly) identified as arrhythmias and recorded by Ritmia, the cardiologist confirmed 589 (56%) as arrhythmias (positives), while 463 (44%) were false positives. Therefore, the Ritmia automatic detection algorithm's positive predictivity value was 56%.

The CNN achieved 90% accuracy on the test set using the model that achieved the peak accuracy on the validation set at the 15th epoch.

Among the 315 tracings in the test set, the CNN correctly reclassified 118/134 (88.7%) false arrhythmias while confirming 166/181 (91.7%) true arrhythmias.

Ritmia uses a programmable sensor with modified firmware to permit use as a standalone, easy-to-wear, ultralight device potentially valuable for

detecting sporadic arrhythmias. Ritmia is programmed to selectively record only apparent arrhythmias, minimizing the cardiologist's time for checking the final report by highlighting, at least theoretically, only the abnormal arrhythmia episodes.

The current study demonstrates that the simple application of a plain CNN model can massively reduce (by almost 90%) the false-positive recordings by the Ritmia device before building a report to be sent to the monitored subject, making cardiologists' work easier and faster.

Highlights

- Applying CNN-based post-processing to the strips recorded by the ultra-light wearable Ritmia sensor significantly improves arrhythmia detection, effectively minimizing false positives.
- Smart wearable devices offer precise and selective detection of sporadic and brief arrhythmias, filling the gap left by standard electrocardiograms and Holter monitoring.
- The evolution of arrhythmia detection is marked by a shift towards long-term self-monitoring, facilitated by low-cost solutions, potentially uncovering more arrhythmias through practical monitoring.

The Parma method: Incorporating 3D printing for accurate in vivo CT analysis for glenoid bone loss

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Citation

Martini, C., Bertolotti, L., Foresti, R., Pagnini, F., Pedrazzi, G., Concari, G., De Filippo, M. The Parma method: Incorporating 3D printing for accurate in vivo CT analysis for glenoid bone loss.

Shoulder instability, often caused by trauma or anterior dislocation, requires an accurate assessment of bone loss using CT imaging to determine appropriate treatment. The percentage of bone loss drives the choice between Bankart's repair or bone augmentation with the Latarjet procedure. Despite the efforts of various experts in the field, there is no consensus on the critical threshold of bone loss (15%-25%). This study aims to validate in vivo the curved-MPR method with 3D printers for a more precise reproduction of the glenoid, overcoming limitations of anatomical variability and interpersonal readings.

To validate the CT cMPR (curved multiplanar reconstruction) "Parma method" in assessing and estimating glenoid bone loss in unstable shoulders.

We utilized a novel approach incorporating 3D printing and advanced software for 3D mesh shape analysis.

The study cohort consisted of twenty patients (mean age 27.7 ± 6.60 years, 90% male) who underwent shoulder CT scans for joint instability or a known bony-Bankart lesion.

Four musculoskeletal radiologists analyzed the images using the cMPR "Parma method".

The method consists in making a curved section plan along the articular surface of the glenoid on an oblique coronal plane and measuring the area of the glenoid surface 'en face' on the oblique sagittal curved plane.

For each patient's scapular glenoid, two sets of forty measurements were recorded: the initial set and a replicate set one month later to evaluate reproducibility.

These measurements were compared against a benchmark set derived from 3D reproductions of the glenoids, created using a 3D printer with PLA (Polylactic acid) filament. The 3D models were scanned with a high precision

laser that generated a digital mesh elaboration, whose surface was measured using a dedicated software.

The inter-observer and intra-operator reliability were quantitatively assessed using the intra-class correlation coefficient (ICC) and Lin's concordance correlation coefficient (CCC), respectively.

The analysis revealed high inter-observer reliability, with ICC values ranging from 0.975 to 0.983, indicating strong agreement among the radiologists. The intra-operator variability was minimal, with CCC values ranging from 0.977 to 0.998. The mean discrepancy in bone loss estimation between the cMPR method and the 3D-printed benchmark was approximately 1%, with a maximum observed difference of 2.85%.

The in vivo CT assessment of glenoid bone loss using the "Parma method", in conjunction with 3D printing and mesh shape analysis software, demonstrates high reliability, reproducibility, and accuracy. These findings validate the application's utility in clinical settings for patients with shoulder instability, to guide the choice between surgical or conservative treatment.

Main Message

Clinical Relevance: Shoulder instability, often stemming from trauma, necessitates precise bone loss assessment for treatment decisions, involving Bankart's repair or Latarjet procedure.

Despite expert efforts, the field lacks agreement on the critical bone loss threshold (15%-25%), posing challenges in treatment decisions.

Training

Development specialists in Europe: Comparison between health, educative systems, and rehabilitation in child disability

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Citation

Cerroni, F., Della, Corte G., Bonifacio, A., Carotenuto, M., Martino, F., Salatiello, R., Pirozzi, A. Development specialists in Europe: Comparison between health, educative systems, and rehabilitation in child disability.

In recent years, there has been considerable progress in policies for social inclusion of children and young people with disabilities to guarantee them fairness and equal opportunities in education and proper rehabilitation assistance in health care. Nevertheless, significant disparities at the European level concerning the complex taking into charge of disorders in the 0-18 group persist. The neuro and psychomotor therapist of developmental age (TNPEE) is in Italy the health care professional who specializes in developmental age and acts with ownership and professional autonomy in prevention, habilitation, and rehabilitation, configuring a global development project. To identify the professional figures that deal with such disabilities at a European level and compare them with the professional and educational profile of the TNPEE, an analysis of the health and educational context in which children and young are cared and assisted for has been conducted.

A comparison between the various public and private health care systems was made, with particular attention to the implemented policies by the individual States which have been taken into consideration, in the management of disability in developmental age and, logically, the health care, social, and educational/training systems, where present and involved therein.

This review leads to understanding the advantages and disadvantages of the individual systems concerning costs, waiting, and equity of access to services for the developmental age and to a certainly not complete but exhaustive framework of health and non-health professionals (as well as their training) in the field of Pediatric Rehabilitation, which varies considerably from one Country to another.

The present study leads to reflect on the different figures who, in the various states, intervene as 'Developmental Specialists' in developing age subjects. The examination carried out highlights not only substantial differences between the analyzed profile and the healthcare realities in which they operate but also wants to recognise the value of the TNPEE, as a unique and peculiar healthcare figure in terms of skills and specificity, and to reflect on the hypothesis to exporting it outside the Italian borders.

Methodology employed for the development of an effective tool for evaluating the competences valid for all health professionals

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Citation

Giusti, M., Peghetti, A., De Rosa, M., Vetromile, A., Durante, S. Methodology employed for the development of an effective tool or evaluating the competences valid for all health professionals.

The theme of assessing the competences of healthcare professionals is receiving particular attention in this current period of healthcare systems reform worldwide. The objective of the ongoing reforms is to ensure, under any circumstances, even during a pandemic, the delivery of healthcare services that are increasingly safer and of higher quality, fully satisfying the health needs of the population through organizational, managerial, and

technological modernization. This is achievable only if health professions with high competences and skills, and consistently keep themselves updated over time are working in healthcare systems based on the latest evidence in medicine. In literature there are numerous measurement tools for assessing competences and skills in nursing, often to be applied in specific healthcare settings and with a high level of detail. On the other side, there are only few measurement tools for assessing competences and skills of technical healthcare professions working in diagnostic, assistance, rehabilitation, and preventive areas. Due to these knowledge gaps, this research aimed to develop a methodology for assessing competences and skills possessed by any healthcare professional belonging to one of the recognized 22 health professions in Italy. A multi professional working group, encompassing all four areas of interest, was formed to establish clear criteria for assessing competencies and skills in professionals. The methodology followed was as follows. In November 2023, a narrative literature review was conducted to identify reference articles that reported measurement tools for assessing competences and skills of health professionals. A total of 42 documents were retrieved. The multi professional working group screened the found articles and only 7 articles were included, all related to nursing area. Subsequently, the criteria used for the competences and skills measurements in all included tools were categorized by working group. Duplicates were removed. Standardization of the remained criteria was carried out to ensure their transversal applicability across all healthcare professions. Consequently, 27 criteria were identified and developed, organized into 10 labels, further divided into 4 overarching areas:

A. Operational Competencies

- Technical Competencies
- Critical Thinking Skills
- Communicative and Relational Competencies

- Ethical and Intercultural Aspects
- Awareness of Professional Responsibility
- Evidence-Based Practice (EBP) Competencies
- Meta-Competencies

B. Managerial Competencies

- Leadership, Organization, and Management

C. Research Competencies

- Research Skills (specific to IRCCS professionals)

D. Educational Competencies

- Tutoring Skills

To ensure the tool's adoption in any healthcare facility, the working group modified each criterion to be applicable in contexts of low, medium, and high complexity.

Uncovering the views of young healthcare students on health research and innovation

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Citation

Sousa, A.C., Pires, A.M. Uncovering the views of young healthcare students on health research and innovation.

Healthcare systems worldwide benefit greatly from the advancement of health research and innovation. To make progress in medical knowledge and patient care, it is crucial to understand the impact of such research. However, there is a lack of understanding among students in healthcare graduations, particularly regarding topics like clinical trials and the willingness to participate in them as healthy individuals. This study aims to fill this gap by investigating the perspectives of young adults aged 18 to 25 who are enrolled in various healthcare fields. The goal is to gain insights into their views on health research and clinical trials. The theoretical framework of this study emphasizes the importance of comprehending the consequences of health research and innovation. It highlights the need to bridge the cognitive divide among healthcare students to ensure informed decision-making and active participation in clinical research efforts. Despite the crucial role of clinical

trials in advancing medical science and developing new treatments, there is a significant lack of awareness among young individuals about their processes and how to engage with them. To address this issue, the study employed an open-ended consultation methodology and involved 57 young adults from diverse healthcare backgrounds and educational institutions. The participants were asked about their knowledge of clinical trials, their willingness to participate in such trials, and their perceptions of the benefits and drawbacks associated with them. The findings of the study reveal a significant lack of understanding among the participants regarding the execution and participation in clinical trials. Many participants expressed hesitancy and fear about volunteering for such trials, citing concerns about safety, efficacy, and the perceived lack of tangible benefits, especially for healthy individuals. Additionally, the lengthy duration of trials emerged as a significant deterrent for potential participants. Despite the challenges identified, the study emphasizes the need for comprehensive education and awareness initiatives targeted at young individuals in healthcare disciplines. By addressing misconceptions and enhancing understanding of the importance of clinical trials, stakeholders can foster a culture of active participation and support in medical research efforts. In conclusion, this study highlights the knowledge gap among young adults in healthcare disciplines when it comes to clinical trials. It underscores the importance of educational interventions to improve awareness and understanding among students, thus creating a supportive environment for clinical research and innovation in healthcare.

Optimization of radiological examinations

Fibre-wise assessment of structural connectivity decrease in bipolar disorder

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Citation

Adraman, A., Bertoldo, A., Manar, R. Fibre-wise assessment of structural connectivity decrease in bipolar disorder.

Bipolar disorder (BD) is a spectrum of psychiatric disorders ranging from major manic episodes (bipolar disorder type-I, BD-I) to hypomania and major depressive episodes (bipolar disorder type-II, BD-II). Although the underlying mechanism still remains unclear, white matter (WM) structural connectivity alterations seem to play a key pathogenic role.

The purpose is to evaluate fixel-based white matter structural connectivity in bipolar disorder as assessed by diffusion tensor imaging (DTI) at 3 Tesla.

To study WM tracts structural differences among BD-I ($n = 29$, mean-age = 43.86 ± 13.10), BD-II ($n = 28$, mean-age = 39.14 ± 12.78) and controls ($n = 45$, mean-age = 41.51 ± 13.13), single-tissue constrained spherical deconvolution (CSD) and fixel-based analysis (FBA) were employed on a mono-shell (b -value = 1000 s/mm^2) 48 diffusion directions DTI dataset.

Results

Compared with controls, BD population shows decreased inter-hemispheric connectivity, mainly determined by WM tracts crossing the body, isthmus and splenium of the corpus callosum (CC), as outlined by the fibre-density, a specific fixel-wise metric proportional to the intra-axonal volume. There is no significant morphology difference on fibre-bundle cross-section fixel-wise metric. Additionally, when comparing patient subgroups with controls, BD-I is characterized by decreased fibre-density in fornix, and body and isthmus of CC, while BD-II showed decreased fibre density in anterior genu and anterior and posterior splenium of CC.

Our fixel-based analysis of 3 Tesla diffusion tensor imaging data in bipolar disorder reveals distinctive changes in inter-hemispheric white matter (WM) connectivity. Examining fibre density metrics, BD-I demonstrates reduced densities in the fornix, body, and isthmus of the corpus callosum (CC), while BD-II displays decreased fibre-density in the anterior genu, anterior, and posterior splenium of the CC. These findings align with established roles of CC regions in mood regulation and cognition, offering insights for targeted therapeutic approaches. However, mono shell DTI and limited diffusion directions constrain into using single-tissue CSD and FBA, while using multi-shell DTI and a higher number of diffusion directions could lead to more robust fibre specific WM tracts identification.

Bipolar disorder spectrum presents specific inter-hemispheric white matter structural connectivity changes that slightly differ according to BD-I and BD-II phenotype.

Main Message

The principal message of the abstract is that fixel-based analysis of 3 Tesla diffusion tensor imaging data reveals distinct inter-hemispheric white matter connectivity changes in bipolar disorder, emphasizing the spectrum nature of the disorder.

The relevance of optimizing scans in CT-guided cryoablation with the use of electromagnetic navigation system

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Citation

Dore, A., Candita, G., Del Cima, F., Crocetti, L. The relevance of optimizing scans in CT-guided cryoablation with the use of electromagnetic navigation system.

In recent years, interventional radiology participates to the multidisciplinary management of oncological disease. Percutaneous CT-guided cryoablation present different advantages, including the possibility to treat deep lesions. Consequentially, the demand for reaching lesions in more difficult locations is growing, requiring a greater number of CT scans to check the route of the needles, with longer procedural time and higher radiation exposure to patients. The introduction of innovative electromagnetic navigation systems

has allowed for faster and safer puncture with CT guidance. These systems consist in a fiducial disk with markers and electromagnetic emitter, that has to be located on the skin near the zone of percutaneous access. The magnetic sensor, sitting in the needle holder, is detected when it is in the fiducial's electromagnetic field, showing the trajectory of the needle on the screen. Subsequently, the operator is able to decide the entry point and angle, even with an "out-of-plane" strategy, and proceeds immediately with the probe insertion, with few requested CT scans.

The aim of this study is to evaluate the influence of electromagnetic navigation systems in the optimization of CT scans by radiographers.

Data from the past two years of cryoablations of kidney, bone and lung lesions were retrospectively reviewed. The values analyzed were the procedure duration time, number of CT-series scanned, and total dose delivered expressed as DLP (Dose Length Product). In addition, total values were normalized by the number of cryoablation probes inserted for each patient. Further evaluation was performed regarding radiographers. They were divided into two groups: one with more and one with less than 10 years of experience. Values were compared between procedures performed with the aid of the electromagnetic navigation system and not.

An initial analysis shows that the navigation system does not bring significant savings in time and dose delivered to the patient, even when normalizing the values for the number of probes. However, analyzing the performance of radiographers shows that, both with the help of the electromagnetic navigation system and without it, radiographers with less experience delivered less dose than those with more experience, both in terms of total DLP and DLP normalized to the number of probes.

Despite literature data indicating otherwise, in our experience we have not been able to make a significant reduction in exposure or intervention duration. This can be explained by a long learning.

Curve for radiologists and more difficult location of the lesions to be treated. For their part, less experienced radiographers delivered a lower amount of dose than their older colleagues, and this is probably because their more recent studies have placed more emphasis on optimizing scanning parameters.

Although new technologies have been introduced, it remains critically important for all radiographers to continue to optimize CT scans during cryoablation procedures.

Main Message

Optimization of CT scan parameters is the exclusive responsibility of the radiographers.

A preliminary study to assess automatic detection of pulmonary embolism and aortic dissection based on an AI-software

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Citation

Nicolò, M., Adraman, A., Risoli, C., Deve, A., Quaranta, E.E., Tadiello, M., Renda, F., Ambrosini, R., Di Terlizzi, M., Grazioli, L., Martini, C. A preliminary study to assess automatic detection of pulmonary embolism and aortic dissection based on an AI-software.

Pulmonary Embolism (PE) and Aortic Dissection (AD) are medical emergencies situations that request proper and fast imaging to be diagnosed and treated correctly.

This study aims to test the reliability of an Artificial Intelligence (AI) based software (Automation Platform) to automatically detect up to segmental PE and thoracic AD alongside the diagnostic process in comparison with radiological reports.

This study retrospectively analyzed 70 patients, who underwent a CTA (Computed Tomography Angiography) of the chest either to rule out PE or AD between February and April 2023. 60 of them were diagnosed with PE and 10 of them with AD. The images were sent to the AI-based software and its report was compared to the radiological report. Cohen's kappa test was used to assess interrater reliability.

13 reports made by the software were recorded as invalid. The interrater reliability of PE showed an agreement of 90% (subjects $n=48$), Cohen's kappa of 0,259 and a p-value of 0.008. The interrater reliability of AD displayed an agreement of 90%, while Cohen's kappa and p-value could not be calculated due to few subjects ($n=10$).

The comparison between the radiological reports and the software's results highlighted fair interrater reliability Cohen's kappa (0.259) with a statistical significance.

This is preliminary research with a small sample. Therefore, other studies are needed to get solid results to clinically validate this software.

This software might be result in a helpful tool for radiologists in an emergency department setting to prioritize the cases, even though other studies with greater samples need to be conducted.

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