

Poster section I. Varia

AI-enhanced Computer Vision Is More Consistent and Accurate in Tracking Operating Room Events Than Manual Documentation

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Background: Despite the prevalence of automated tools for event registration, high-end surgical suites still rely on manual documentation. An AI-enhanced computer vision system (Apella) has been used to track patient entry and exit events and inform surgeons via automated text messages in the cardiovascular operating rooms at Houston Methodist Hospital. Our goal was to compare the system's accuracy and latency to manual documentation.

Methods: Between 12.01.2022 and 03.08.2024, patient entry and exit times were recorded simultaneously and prospectively by Apella and documented manually in the electronic health records. Video footage from each procedure was reviewed, and the true time of each event (ground truth) was established. Accuracy was defined as the absolute difference of time between the ground truth and the assessed time of the event; latency as the elapsed time from the ground truth to the time of documentation. Results: 6,115 entries and 6,098 exits were confirmed. Apella's median accuracy for determining entry times was 10 s [5 – 15], while the manual documentation's was 17 s [5 – 41] ($p < 0.001$). For patient exit, Apella's median accuracy was 10 s [5 – 15] vs. 24 s [8 – 56] of manual documentation ($p < 0.001$). Apella's median latency was 60 s [47 – 70] and 10 s [5 – 15] vs. the manual documentation's being 32 s [5 – 539] and 4 s [-14 – 116] for entries and exits respectively ($p = 0.003$). Conclusion: This study demonstrated comparable accuracy, latency, and superior consistency of a computer vision-based AI method in registering patient entry and exit times over manual documentation.

Combined Endovenous Thermal Ablation and Foam for Treatment Large Great Saphenous Veins

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Background: The size of a "large diameter" has ranged from 8 mm to 15 mm and above in the studies. GSV aneurysms are defined as local dilations of the GSV diameter > 20 mm. We report our experience in treatment of large GSV using combined ETA with foam to show the effectiveness and safety of this treatment strategy. Methods: We report the results of the combined treatment in 47 patients (47 limbs) with GSV incompetence (C2-C6) treated with RFA and foam sclerotherapy between October 2023 and November 2024 were retrospectively analyzed. The combined treatment consisted of placing the RFA catheter in the GSV in the distance 1,5-2 cm the saphenofemoral junction and than was injected the foam (polidocanol foam, prepared according to the Tessari method) in the 1/2 GSV using ultrasound guidance. Follow-up was conducted at 2 weeks, 3, 6 months after intervention. Results: 91,3% of the treated limbs were C2-C4 and 8,7% C5-C6. The mean GSV diameter was 12,9+2,7 mm (max 25,5 / min 10,6 mm). 14% of the patients had GSV aneurysms, the mean diameter was 27,8+4,8 mm (max 34,6 / min 21,9 mm). Primary occlusion was achieved in all patients (100%). 6 limbs (12,6%) required microthrombectomies of tributary veins due to local induration. One patient (2,1%) had type 1 endovenous heat-induced thrombosis, which was successfully treated with anticoagulation. Conclusion: Our results demonstrate a high occlusion rate of large diameter GSV with combined RFA and foam sclerotherapy. Using this technique is effective and safe and comparable with other endovenous treatments for chronic venous disease. Sclerotherapy makes a good direct contact of the fiber tip with the venous endothelium due to the response of endothelium spasm to the

Comparing the effectiveness and safety of particle and liquid embolic agents in bronchial artery embolisation

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Purpose: Bronchial artery embolization is indicated in all patients with severe and life-threatening hemoptysis. However, there hasn't been any meta-analysis that compared the effectiveness and safety of particle (polyvinyl-alcohol (PVA) and microsphere) and liquid (N-butyl-cyanoacrylate (NBCA)) embolic agents. **Materials and methods:** We've conducted a systematic search in Pubmed, Embase, Cochrane Library, Scopus, and Web of Science. We've found 5513 articles; after the title-abstract and full-text selection, we extracted data from 59 retrospective observational studies. Technical success, clinical success, perioperative mortality, 1-, 3-, 6-, and 12-month hemoptysis recurrence rates, and complication rates were extracted from the articles. **Results:** Clinical success was achieved in 95% of the cases in the particle group (95% CI- 89-98%) and 95% in the liquid group as well (95% CI- 92-97%); no significant difference was found ($p=0.935$). 12-month hemoptysis recurrence was observed in 14% (95% CI- 4-38%) and 17% (95% CI- 10-28%) of the cases in the particle and liquid group, respectively; no significant difference could be observed ($p=0.667$). Subgroup analysis revealed that significantly higher proportions of hemoptysis recurrence were observed between patients with malignant and non-malignant lung disease at all follow-up times (1 month: 0.26 vs 0.05; $p<0.001$; 3 months: 0.44 vs 0.08; $p<0.001$; 6 months: 0.56 vs 0.12; $p<0.005$; 12 months: 0.66 vs 0.11; $p<0.001$). **Conclusion:** Based on the outcomes observed in 59 retrospective studies, particle and liquid embolic agents can be an effective and safe option for treating hemoptysis.

Effect of extreme temperature and air pollution on the incidence of myocardial infarction

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Background: In Hungary, approximately 30,000 people suffer from acute myocardial infarction (AMI) each year. While several risk factors for AMI are well known, fluctuations in case numbers over time suggest a possible relationship between temperature, air pollution, and AMI incidence rates. **Purpose:** To explore potential correlations between national AMI case rates and temperature trends. **Methods:** The correlations between AMI cases recorded in the Hungarian National Myocardial Infarction Registry from 2014 to 2023 and daily temperature data from the National Meteorological Service were analyzed using various artificial intelligence-based mathematical models, including Poisson regression and XGBoost. Our method assigns weights to points within an environmental factor space, allowing for the detection of significant associations through density ratio analysis. After identifying outliers in the number of cases (top and bottom 10% based on Z-scores), we analyzed the potential influence of atmospheric parameters using distribution analysis and density ratio heatmaps. **Results:** During the winter months, cold weather (average temperature $<-1^{\circ}\text{C}$) increases the number of AMI cases compared to the average daily case numbers for the given period. Under such conditions, the proportion of days falling into the top 10% of case numbers rises by at least 15%. Days with extreme case numbers are associated with days of extreme average temperatures. In summer, when average temperatures exceed 20°C , both low and high case number days become more frequent, and the number of cases fluctuates more significantly. When the average temperature exceeds 25°C , the proportion of days in the top 10% of case numbers decreases by at least 10%. **Conclusions:** These results may provide an opportunity in the future to better identify patient groups with increased vulnerability to AMI under specific conditions. This work has been implemented by the National Multidisciplinary Laboratory for ClimateChange (RRF-2.3.1-21-2022-00014) project within the framework of Hungary's National Recovery and ResiliencePlan supported by the Recovery and Resilience Facility of the European Union.

Environmental Determinants of Out-of-Hospital Cardiac Arrest: Temperature and Pressure Extremes as Risk Factors

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Environmental Determinants of Out-of-Hospital Cardiac Arrest: Temperature and Pressure Extremes as Risk

Factors

Keywords: Out-of-Hospital Cardiac Arrest (OHCA), Environmental Factors, Temperature Extremes,

Atmospheric Pressure, Density Ratio Analysis

Introduction: This study investigates correlations between

environmental factors and the daily incidence of out-of-hospital cardiac arrest (OHCA) in Hungary.

Materials and Methods: Our database consists of a comprehensive registry of all OHCA cases recorded by the Hungarian

National Ambulance Service from 11.2018 to 08.2024, paired with meteorological data from the Hungarian

Meteorological Service, providing complete nationwide coverage. Our method assigns weights to points within an

environmental factor space, enabling the detection of significant associations through density ratio analysis. After

identifying the outliers in the number of cases (top and bottom 10% based on Z-scores), we examined the possible

role of atmospheric physical and atmospheric chemical parameters using distribution analysis and density ratio

heatmaps.

Results: Both extremely low ($<0^{\circ}\text{C}$) and high ($>25^{\circ}\text{C}$) temperatures were associated with increased

OHCA incidence, while moderate temperatures ($5\text{--}20^{\circ}\text{C}$) corresponded with lower OHCA rates. Similarly,

extreme daily temperature fluctuations demonstrated higher cardiac arrest risk compared to moderate temperature

changes, with particularly strong effects observed for severe temperature drops (around -8°C). Atmospheric

pressure exhibited a U-shaped relationship with OHCA incidence, with both very low ($<985\text{ kPa}$) and very high

($>1015\text{ kPa}$) values linked to increased events.

Conclusion: By identifying environmental conditions linked to high

case numbers, we facilitate better allocation of medical resources, improving response times and system

efficiency. This approach may help emergency services anticipate periods of increased cardiac events based on

weather forecasts, allowing for proactive resource management during critical periods.

This work has been

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project within the framework of Hungary's National Recovery and Resilience Plan supported by the Recovery and

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Nucleoside-modified mRNA mediated modulation of organ-specific lymphatic growth and function in preclinical animal models

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Lack or dysfunction of the lymphatic system leads to secondary lymphedema formation that seriously reduces the function of the affected organs and results in the degradation of quality of life. Currently, there is no definitive treatment option for lymphedema. Recently, we utilized nucleoside-modified mRNA encapsulated into lipid nanoparticles (LNPs) encoding Vascular Endothelial Growth Factor C (VEGFC) to stimulate lymphatic growth and function and reduce experimental lymphedema in mouse models. We demonstrated that the administration of a single low dose of VEGFC mRNA-LNPs induced durable, organ-specific lymphatic growth and formation of a functional lymphatic network. Importantly, VEGFC mRNA-LNP treatment reversed experimental lymphedema by restoring lymphatic function without inducing any obvious adverse events. While mRNA-LNP vaccines have been shown to induce a robust and durable humoral immune response, the underlying molecular and cellular mechanisms involved in this response are still not fully understood. In our current experiments our aim is to investigate the role of lymphatics in nucleoside-modified mRNA-LNP induced organ-specific responses in mouse models. Our results indicate that the lymphatic endothelial cell dependent mechanisms are essential for generating an adequate immune response to mRNA-LNP vaccines, offering valuable insights for optimizing these platforms.

Ruptured aortic aneurysms and the alternation of biometeorological parameters; a new method to forecast rare events

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Introduction: In our work, we investigated the existence of a relationship between fatal aortic aneurysm ruptures and changing meteorological conditions. Our aim was to obtain detailed knowledge about the occurrence of the events and their association with certain meteorological parameters or local patterns.

Method: We conducted a retrospective clinicopathological analysis of data spanning 20 years from the SE database and then used the Pécze macro-synoptic classification to investigate which weather types increase the likelihood of rupture.

Following this, we performed Pearson's chi-square test to refute the independence of rAA from weather

types, thus providing evidence for the relationship between meteorological parameters and rAA.

Results: Among a

total of 161 cases (106 males, 55 females), the average age was 70.3 ± 11.8 years. No significant seasonal peak was found; according to our calculations, Pécze weather type 3 showed the highest relative frequency 2 days before the events, and type 9 was the highest on the days of the events. We found that atmospheric pressure changes had a more significant effect than daily temperature. Increased atmospheric pressure favored the occurrence of rAA, especially at low daily mean temperatures. Conclusion: We found connection between fatal rAA and alternating biometeorological conditions. We examined the connection from the aspect of complex meteorological patterns and from individual parameters as well. We hope that our knowledge will be useful in the prevention of rAA and we aim to use our approach with other sudden onset diseases as well.

Synoptic Weather Patterns and Their Relationship to Neurological Vascular Emergencies

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Background: Climate change exacerbates morbidity linked to meteorological conditions. While many studies focus on specific weather parameters, few consider synoptic patterns over geographic areas. Objective: This study explores the correlation between Pécze Weather Patterns and emergency room (ER) visits for neurological emergencies in a suburban hospital in Budapest. Methods: We analyzed medical data from the hospital (2015–2019), covering 34,560 neurological ER admissions. Using Pécze synoptic classification, we modeled the relationship between weather patterns and neurological emergencies, developing a predictive simulation to estimate patient loads. Implications: This approach supports healthcare resource allocation by predicting potential increases in neurological emergencies based on weather patterns, enhancing preparedness and response.

The Effect of Latency and Force on Performance in an Endovascular Simulation Task: Applications in Robotic Telesurgery

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Background: Endovascular procedures require precise force application and control, which can be affected by latency in robotic or telesurgical systems. This study aimed to assess the impact of latency and applied force on accuracy in an endovascular procedure simulation task, exploring the potential role of haptic feedback in improving task performance. Methods: A prospective, observational, cross-sectional experimental study was conducted using a custom-build endovascular procedure simulator. A total of 116 healthy volunteers performed a task requiring them to maintain a target force (0.6N, 1.2N, or 1.8N) for as long as possible within a 10-second window under different latency conditions (0, 100, 200, and 400 ms). The effects of different latency and force were analyzed across three age groups: Group 1 (18–25 years), Group 2 (35–45 years), and Group 3 (55–65 years). Results: The youngest group consistently performed the best, while the oldest group showed the lowest results in all tasks. The Kruskal-Wallis test revealed statistically significant differences in performance across latency and force conditions ($p < 0.05$). Post hoc pairwise comparisons indicated a significant decline in performance with increasing latency and force levels. A statistically significant difference was observed between 0.6N and 1.8N force ($p < 0.05$) and between all latency conditions except between 0 ms and 100 ms ($p > 0.05$) in all groups. Spearman's correlation analysis revealed a weak negative correlation between force and duration ($\rho = -0.263$), and a strong negative correlation between latency and duration ($\rho = -0.663$), suggesting that higher latency significantly impaired task performance. Conclusions: This study shows that both latency and applied force negatively impact performance, with latency having a stronger effect. These findings highlight the importance of minimizing latency, especially in older populations. Additionally, the results raise a hypothesis that haptic feedback technology may be more effective with smaller force levels, warranting further investigation into its potential benefits.