Developing a Methodology and Basic Practical Application to Identify the Causative Agent Based on Symptoms in the Event of a Chemical Accident or Disaster Where the Agent Is Unknown

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Introduction: Chemical disasters occur continuously around the world, but it is not easy to respond quickly when the causative substance is unknown. It is possible to estimate the substance through information, documents, and labeling, but it is limited to chemical accidents within the company or in vehicles that are labeled with substance information, so it is difficult to identify substance information in real time in chemical terrorism, illegal chemical production, and chemical warfare. Therefore, this study investigated systems that estimate chemical substances based on symptoms and applied representative substances in practice.
Methods: In this study, the international status and development of symptom-based chemical accident causative agent estimation systems that can be analyzed were investigated through the literature and internet searches. After analyzing 400 chemical accidents for five years through the Comprehensive Chemical Information System, eight substances were selected after excluding duplicate chemicals. Symptoms of exposure to these eight substances were analyzed through WISER.
Results: Representative systems include Chemical Companion and Toxicology Information Center, and WISER was ahead in providing probabilistic estimates of chemicals through symptoms. Estimation through artificial intelligence was under research and not applied in practice. Symptom analysis of exposure through WISER can be summarized into 17 typical symptoms.
Conclusion: As there are existing contents such as emergency medical information databases and response scenarios for symptoms and medical consequences of chemical accidents, it is expected that the foundation of the causative agent estimation system can be secured by utilizing existing contents and technologies such as artificial intelligence in the future.

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Research and Development of Intelligent Auxiliary Diagnostic System for Rhabdomyolysis Based on Machine Learning

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Introduction: Crush syndrome, also known as traumatic rhabdomyolysis, often occurs in disasters like earthquakes, traffic accidents, and building collapses. It results in muscle cell necrosis, leading to symptoms such as hypovolemic shock, hyperkalemia, and acute kidney injury (AKI). The mortality rate of rhabdomyolysis is about 10%. An intelligent auxiliary diagnostic system for rhabdomyolysis based on machine learning is crucial.
Methods: This study aimed to develop an intelligent auxiliary diagnostic system, utilizing the MIMIC-III database and electronic medical records from several Chinese hospitals. The system was trained and validated with 70% and 30% of patient data, respectively. A variety of machine learning methods were used to establish injury grading and prognosis assessment models, and statistical methods and feature importance assessment methods were used to analyze and explain the features selected by the model.
Results: The 22 clinical indicators originally included in the modeling were reduced to 11 through feature analysis and feature screening. In internal tests, the auxiliary diagnostic system based on 11 parameters achieved an average accuracy of 0.89. External validation with 360 cases showed an average accuracy of 0.84, with an AKI prediction accuracy of 0.83 and an AUC value of 0.82. Death risk prediction accuracy reached 0.89.
Conclusion: This intelligent auxiliary diagnostic system provides valuable recommendations for the diagnosis and treatment of rhabdomyolysis, improving treatment success rates and optimizing medical resource allocation in disaster situations. By leveraging machine learning, we have established a robust and reliable tool to assist healthcare providers in managing this complex condition.

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Rapid Monitoring of the Impact of Pandemic on the Healthcare System: Achievements and Implications

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Introduction: During a pandemic, it is essential to have timely and effective responses to rapidly monitor its impact on the healthcare system. The system of data collection, analysis, and feedback was reconstructed for this purpose.
Methods: To rapidly measure the COVID-19 impact, a subproject was launched early in 2020 as part of the Quality Indicator/Improvement Project (QIP), to which over 500 hospitals were voluntarily registered from across the nation. In normal times, the anonymous individual-level data of all the patients of participating hospitals were routinely collected and securely stored in the QIP database securely managed. Under the COVID-19 pandemic, QIP was converted into an emergency mode, which enabled a more rapid assessment of the healthcare system. Statistical methods used included interrupted time-series analysis adjusted for seasonality and time trends.
Results: During the pandemic, inpatient visits were reduced in almost all areas, including stroke, myocardial infarction, heart failure, pneumonia, insufficiency fractures, and even cancer surgeries, except for alcohol-induced diseases. Furthermore, the number of inpatients and outpatients did not recover even after the pandemic was over, which showed an increasingly difficult

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