**ANNOTATED BIBLIOGRAPHY- MIDTERM**

**PICO question:**

In hospital admitted patients, does integration of Clinical Decision Support System (CDSS) into Electronic Health Records (EHRs) result in improved prognosis and risk analysis for a given condition when compared to clinical decisions taken by physician alone?

P – Inpatients

I – CDSS integrated with EHRs

C – Physician’s clinical decision

O – Improved prognosis and risk assessment

T – Case Control

S – Hospital

**ARTICLE - 1**

**Complete Bibliographic citation:**

Akamine, Akihiko, RPh, MSc, Takahira, Naonobu, MD, PhD, Kuroiwa, Masayuki, MD, PhD, et al. (2022). Venous thromboembolism risk factors and usefulness of a risk scoring system in lower limb orthopedic surgery: A case-control study in Japan. *Medicine, 101*, e28622. <https://doi.org/10.1097/MD.0000000000028622>

Full link to the article: <https://doi.org/10.1097/MD.0000000000028622>

**Summary:**

The researchers created a computerized clinical decision support system to assess the risk of venous thromboembolism in patients who had lower-limb orthopedic surgery and to see if there was a link between the overall risk score and thromboembolism. The records of 649 patients who underwent surgery at a tertiary care facility in Japan between January 2015 and August 2018 were reviewed in this retrospective case-control study. Using logistic regression analysis, the computerized CDSS was used throughout the inpatient time to identify independent risk variables. People over the age of 68 were found to be at an elevated risk of thromboembolism and required early prophylaxis, according to the findings. A possible link between the overall risk score and the occurrence of thromboembolism was discovered using the Cochran–Armitage trend test.

**Relevance to PICO question:**

This paper effectively built a computerized clinical decision support system to identify risk variables, proving and justifying the PICO question. This CDSS assists in the prediction of future thromboembolism risks in individuals who have had lower limb orthopedic surgery. This helps to reduce problems by allowing for early detection and a better prognosis.

**The uniqueness of the study:**

This study is unique in that it uses multivariate logistic regression analysis to identify the independent risk variables unique to thromboembolism. The significance of the findings is increased by a review of the study's data by two independent researchers.

**Strength:**

* In addition to identifying risk variables, this research explored the correlation between the overall risk score and the occurrence of thromboembolism.
* Emphasized the necessity of forecasting the risk score in order to avoid problems, allow for prophylaxis, and shorten the time spent in the hospital following surgery.

**Weakness:**

In calculating the risk analysis, the study focused mostly on the age component. Other characteristics such as gender, ethnicity, and previous medical history were not considered when calculating the results. As a result, more study is needed to confirm the findings.

**Bias:**

No conflicts of interest reported among authors, and they have no funding.

**Evaluation of authors:**

1. Naonobu Takahira: Orthopedic Surgery, Clinical Medicine, Graduate School of Medical Sciences, Kitasato University, Sagamihara, Kanagawa, Japan. Physical Therapy Course, Department of Rehabilitation, Kitasato University School of Allied Health Sciences, Sagamihara, Kanagawa, Japan. Areas of interest are clinical medicine, epidemiology, informatics
2. Akihiko Akamine: Orthopedic Surgery, Clinical Medicine, Graduate School of Medical Sciences, Kitasato University, Sagamihara, Kanagawa, Japan. Department of Pharmacy, Kitasato University Hospital, Sagamihara, Kanagawa, Japan and areas of interest include pharmacology and applied sciences.
3. Masayuki Kuroiwa: Department of Anesthesiology, Kitasato University School of Medicine, Sagamihara, Kanagawa, Japan.
4. Atsushi Tomizawa: Department of Pharmacy, Kitasato University Hospital, Sagamihara, Kanagawa, Japan.
5. Koichirou Atsuda: Department of Pharmacy, Kitasato University Hospital, Sagamihara, Kanagawa, Japan. Research and Education Center for Clinical Pharmacy, Division of Clinical Pharmacy, Laboratory of Pharmacy Practice and Science 1, Kitasato University School of Pharmacy, Tokyo, Japan.

**ARTICLE-2**

**Complete Bibliographic citation:**

Hur, Eun, Young PhD, MSN, Jin, Yinji, PhD, MSN, Jin, Taixian, Lee, Sun-Mi, et al. (2019). Development and Evaluation of the Automated Risk Assessment System for Catheter-Associated Urinary Tract Infection. *CIN: Computers, Informatics, Nursing, 37*, 463-472. <https://doi.org/10.1097/CIN.0000000000000506>

Full link to the article: <https://doi.org/10.1097/CIN.0000000000000506>

**Summary:**

The study used a UTI risk scoring system to create an Automated Risk Assessment System for Catheter-Associated Urinary Tract Infection (Auto RAS-UTI). This Auto RAS-UTI was connected with EHRs to identify individuals at risk of UTIs and classify them according to the severity of their sickness. The secondary data gathered from EHRs of a 1356-bed teaching hospital in Seoul, South Korea, was analyzed using a retrospective case-control approach. Multivariate logistic regression data analysis was used to create the risk-scoring algorithm. The created model's validity was predicted at regular intervals. The findings revealed a high-risk category for UTIs, with the application duration of an indwelling urinary catheter being the most relevant risk factor. Color-coded notifications would then be flashed on the monitoring displays for persons who have been identified as being in danger.

**Relevance to PICO question:**

This study's risk assessment approach was shown to be successful in detecting and categorizing patients based on risk variables. By giving color-coded alerts on monitoring screens, the Auto RAS-UTI coupled with EHRs assisted nurses and physicians in early identifying those persons at risk of UTIs. This aided in reducing hospital stays and ensuring the best possible prognosis.

**The uniqueness of the study:**

The Auto RAS-UTI prediction model was not directly implemented in this work. The cornerstone for Auto RAS-UTI was the creation of a main UTI risk rating algorithm, which was carefully tested at regular intervals and proved to be consistent. Sensitivity, specificity, positive and negative predictive values, and the Youden Index were used to evaluate predictive values and cutoff scores used to rule out distinct variables derived from EHRs. When the default risk factors were added to Auto RAS-UTI to categorize people into risk category groups, it became even more distinctive.

**Strength:**

* This study's endeavor to construct the Auto RAS-UTI, which was integrated with EHRs, and verify its validity to suggest an automated electronic CA-UTI evaluation system is one of its merits.
* The Auto RAS-prediction UTI's validity remained stable.
* The outcomes of this study corroborated prior research on the necessity to reduce the length of indwelling catheter application to avoid CA-UTIs.
* Automated alerts and remainders assisted medical personnel in removing indwelling catheters at regular intervals by categorizing patients into high, moderate, and low risk categories based on risk assessment algorithms and default risk variables.

**Weakness:**

* The study solely looked at data from electronic health records (EHRs), excluding nonspecific UTI symptoms and data from nurse diagnoses.
* •The research was carried out in an acute hospital environment; hence the findings cannot be applied to multi-specialty settings.

**Bias**:

None declared.

**Evaluation of authors:**

1. Eun Young Hur: College of Nursing, The Catholic University of Korea, Seoul, Korea
2. Yinji Jin: College of Nursing, Yanbian University, Yanji, China China and her research of interest is comparison of existing literature to 19th century British literature.
3. Taixian Jin: College of Nursing, The Catholic University of Korea, Seoul, Korea. Areas of research include psychology and medicine.
4. Sun-Mi-Lee: College of Nursing, The Catholic University of Korea, Seoul, Korea and research interests include Applied science and informatics.

**ARTICLE - 3**

**Complete Bibliographic citation:**

Jung, Hyesil, MSN, RN, Park, Hyeoun-Ae, PhD, RN, FAAN, FACMI, Hwang, Hee, et al. (2020). Improving Prediction of Fall Risk Using Electronic Health Record Data With Various Types and Sources at Multiple Times*. CIN: Computers, Informatics, Nursing, 38*, 157-164. <https://doi.org/10.1097/CIN.0000000000000561>

Full link to the article: <https://doi.org/10.1097/CIN.0000000000000561>

**Summary:**

The efficiency of prediction algorithms created to identify fall hazards is discussed in this article. The data for the research is taken from a variety of EHRs, all of which were recorded at different dates and with distinct data formats. This study used three models, and the results were compared to the current Hendrich II Fall Risk Model to see how successful they were. The study's findings suggested that fall risk models may be incorporated in CDSS to offer evidence-based practice in the given hospital context, implying that fall risk models could be integrated in CDSS to provide evidence-based practice.

**Relevance to PICO question:**

A total of 105 falls were reported in the study that was not recorded by the event reporting system. This research demonstrates the effectiveness of these prediction models and the usefulness of CDSS in preventing unfavorable outcomes.

**The uniqueness of the study:**

* Previously, research depended on incident-reporting systems to detect fall incidents, but the risk predicting model created employed nurses' progress notes as a supporting data source.
* •To integrate data from several health records with distinct data kinds and recorded at different time periods, special criteria were devised. Coverage, currency, and granularity were among the data processing requirements.
* Three predictive modeling approaches were investigated in this study: logistic regression, Cox proportional hazard regression (especially for determining the moment of fall), and decision tree.

**Strength:**

* Because numerous data were taken at several times, the study was able to precisely document patient data at the moment of fall. This eliminated the possibility of missing features.
* Sensitivity, specificity, PPV, NPV, and AUC were used to evaluate the predictive performance of all three models.
* Dysuria was found as the second most prevalent risk factor in this investigation.
* The established models revealed intrinsic risk factors for falls, and changes to these risk variables reduced the number of falls.

**Weakness:**

The study's generalizability is restricted since the data collected came from only a few patients.

The model's external validity will be tested in a large-scale context.

Further study is needed since environmental data and other risk variables not contained in the EHRs are not taken into account when calculating the outcomes.

**Bias:**

No statement of bias.

**Evaluation of authors:**

1. Hyesil Jung: College of Nursing and Research Institute of Nursing Science, Seoul National University, Seoul, South Korea. Areas of interest include nursing informatics.
2. Hyeoun-Ae Park: College of Nursing and Research Institute of Nursing Science, Seoul National University, Seoul, South Korea. Areas of interest include nursing informatics.
3. Hee Hwang: Office of eHealth Research and Business, Seoul National University Bundang Hospital, Seongnam, South Korea.

**ARTICLE – 4**

**Complete Bibliographic citation:**

Han, Peijin, Lee, Sang, Noro, Kazumasa, Haller, John, Nakatsugawa, Minoru, Sugiyama, Shinya, et al. (2021). Improving Early Identification of Significant Weight Loss Using Clinical Decision Support System in Lung Cancer Radiation Therapy. *JCO Clinical Cancer Informatics, 5*, 944-952. <https://doi.org/10.1200/CCI.20.00189>

Full link to the article: <https://doi.org/10.1200/CCI.20.00189>

**Summary:**

This article underlines the need of identifying individuals who are at risk of severe weight loss while getting lung cancer radiation at regular intervals. In addition, the paper mentions the usage of a prediction model and the CDSS in determining this risk. Patients undergoing therapy for primary lung cancer between June 1, 2019, and January 31, 2020, were included in the prospective cohort research, which was based on the Oncospace database at Johns Hopkins Radiation Oncology. In terms of sensitivity, specificity, PPV, and NPV, the study's findings demonstrated the usefulness of CDSS in predicting risk when compared to physicians.

**Relevance to PICO question:**

The newly developed CDSS system can be smoothly incorporated with standard lung cancer radiation and EHRs, allowing clinicians to improve their forecast during radiotherapy planning, perhaps resulting in improved treatment outcomes.

**The uniqueness of the study:**

The created machine learning model employs radiomics and dosiomics image attributes to produce the requisite weight loss predictions with intervention at various intervals.

**Strength:**

* In terms of accuracy, specificity, PPV, and NPV, the algorithm's predictions outperform those of a single physician.
* With the help of CDSS, a physician's estimate of the risk of weight loss improved.

**Weakness:**

Comprehensive research on a larger patient cohort is needed to further investigate the usefulness of CDSS in improving outcomes and predicting hazards, as the sample size is too small to be statistically significant.

**Bias:**

No statement of bias and the study was supported by Canon Medical Systems Corp.

**Evaluation of authors:**

1. Peijin Han: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.
2. Sang Ho Lee: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.
3. Kazumasa Noro: Canon Medical Systems Corp, Otawara, Japan.
4. John W Haller: Canon Medical Research USA, Inc, Vernon Hills, IL.
5. Minoru Nakatsuhawa: Canon Medical Systems Corp, Otawara, Japan.
6. Shinya Sugiyama: Canon Medical Systems Corp, Otawara, Japan.
7. Michael Bowers: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.
8. Pranav Lakshminarayanan: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.
9. Jeffrey Hoff: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.
10. Cole Friedes: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.
11. Chen Hu: Department of Oncology Biostatistics and Bioinformatics, Johns Hopkins University, Baltimore, MD.
12. Todd R McNutt: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.
13. K Ranh Voong: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.
14. Junghoon Lee: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.
15. Russell K Hales: Department of Radiation Oncology and Molecular Radiation Sciences, Johns Hopkins University, Baltimore, MD.

**ARTICLE - 5**

**Complete Bibliographic citation:**

Kang, Min-Jeoung, MSN, RN, Jin, Yinji, PhD, RN, Jin, Taixian, MSN, RN, et al. (2018). Automated Medication Error Risk Assessment System (Auto-MERAS). *Journal of Nursing Care Quality*, 33, 86-93. <https://doi.org/10.1097/NCQ.0000000000000266>

Full link to the article: <https://doi.org/10.1097/NCQ.0000000000000266>

**Summary:**

The Automated Medical Error Risk Assessment System (Auto-MERAS) was designed to forecast the risk of medical errors, and the paper underlines the importance of detecting medical errors early. The study took place in a university tertiary hospital in Korea, and it relied only on data from electronic health records (EHRs) to identify risk variables and construct the algorithm. Sensitivity, specificity, AUC, NPV, and PPV are used to assess the model's predictive validity. The study's findings revealed seven risk factors for medical mistakes, all of which are essentially patient-specific and linked to changes in the environment. The importance of using CDSS and risk predicting models in EHRs is emphasized.

**Relevance to PICO question:**

This CDSS's alarm alerts and reminders help to prevent life-threatening circumstances caused by drug mistakes' harmful consequences. This study's finding aspires to be useful in regular clinical practice.

**The uniqueness of the study:**

* The study offers the potential to anticipate medical mistakes that are sensitive to situational and environmental hazards without requiring nurses to enter any data.
* The goal of the project was to create an Automated Medical Error Risk Assessment System (Auto-MERAS) to avoid medical mistakes caused by nurses using just data from EHRs.

**Strength:**

* Auto MERAS can effectively aid medical personnel in providing services and reducing mistakes, with an AUC of 0.80 indicating the model's predictive validity.
* Reduce the expenditures incurred as a result of problems and unknowns.

**Weakness:**

* Analyzed the data present only in EHRs to formulate risk factors.
* Limited scope of generalizability.
* Lack of evidence in the study to determine the impact of Auto MERAS.

**Bias:**

No conflicts of interest reported. Research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by Ministry of Education, Science and Technology.

**Evaluation of authors:**

1. Min-Jeoung Kang: College of Nursing, The Catholic University of Korea, Seoul, Korea. Research areas of interest include EMR, Nursing informatics.
2. Sun-Mi-Lee: PhD, RN, College of Nursing, The Catholic University of Korea and research interests include Applied science and informatics.
3. Yinji Jin: College of Nursing, Yanbian University, Yanji, China and her research of interest is comparison of existing literature to 19th century British literature.
4. Taixian Jin: College of Nursing, The Catholic University of Korea, Seoul, Korea. Areas of research include psychology and medicine.

**WORKS CITED PAGE:**

Graphical user interface, text, application

Description automatically generated

Graphical user interface, text, application, email, Teams

Description automatically generated

**ENDNOTE SCREENSHOT WITH ARTICLES AND PDFs:**

Graphical user interface, text, application, email

Description automatically generated